Appendix C

704-653B

ENVIRONMENTAL ATLAS OF NEW ENGLAND CHANNEL AND HARBOR BOTTOM SEDIMENTS

VOLUME I

FEDERAL PROJECTS WITHIN LONG ISLAND SOUND AND FISHERS ISLAND SOUND

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
1980

INTRODUCTION

The New England Division has collected and amassed a vast data base of physical and bulk chemical results on marine and estuarine sediments sampled from Federal navigation projects in New England over the last decade. The data base at present consists of analyses of over 1,400 samples taken from Federal channel areas of 113 harbors.

This atlas is designed to provide an inventory of all environmental sampling and testing of marine and estuarine sediments taken from Federal navigation projects within the New England Division, from September, 1969 to July, 1980. It is presented in four sections delineated by geographic and oceanographic boundaries (tidal systems and, to some extent, major drainage basins).

Volume I - Long Island Sound and Fishers Island Sound
Volume II - Narragansett Bay, Mt. Hope Bay, Block Island, and Western Buzzards Bay
Volume III
Section A - Nantucket Sound, Vineyard Sound and Eastern Buzzards Bay
Section B - Massachusetts Bay and Cape Cod Bay

Volume IV - Central and Northeastern Gulf of Maine (Cape Ann to St. Croix River)

The first two sections contain all projects classified within the North Atlantic Tidal System. The second two sections contain all projects classified within the Gulf of Maine Tidal System. Volume III is subdivided into two sections by the "elbow" of Cape Cod.

At the beginning of each volume are explanations of the New England Divisions environmental sampling and testing programs. Included in this are descriptions of sampling methods, testing procedures and rationales. Explanations of the various physical and chemical parameters are also presented.

An explanation of the statistical classification system used for reporting test results for each Federal project is also given.

The second part of each volume contains individual reports for each Federal navigation project. Included in each project report are a description of the distribution of chemical constituents within the project sediment as compared to an "average sediment", an index of all sampling and testing undertaken by or for the New England Division, physical data for each sample taken within a project, a summary of all bulk chemistry data for both fine and coarse sediments presented as average values for each sampling effort, and a summary of all elutriate test results presented as averages for both virgin water samples and elutriate mixes for each sampling effort.

The degree of concentration of any one constituent within any one project may be determined by comparing the value presented in the individual project report with the average value for that parameter as shown in the statistical summary table (page 26).

In some harbors, which have been frequently sampled, it is possible to discern trends of increasing and/or decreasing (with time) bulk concentrations of one or more chemical constituents by comparing values from different years (sampling efforts).

This atlas was conceived and written by Mr. Mark L. Habel, assisted by Ms. Laura DiLuca of the Water Control Branch, Marine Science Unit, Engineering Division, New England Division, Corps of Engineers.

2 October 1980

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LIST OF MAPS
(VOLUME I)

PART I

NEW ENGLAND DIVISION ENVIRONMENTAL SAMPLING AND TESTING PROGRAM FOR MARINE AND ESTUARINE SEDIMENTS

ENVIRONMENTAL SAMPLING PROCEDURES

The type of sampling undertaken within a project area is determined by examining existing relevant physical data obtained from previous sampling efforts. The various types of analyses to be performed may require different sampling methods and handling procedures. Sampling stations to be used exclusively for physical and chemical testing may be located by sextant. Sampling stations to be used for bioassay are to be located accurately by second order triangulation or ranges established by that procedure.

TUBE SAMPLING

Tube sampling (sample designated P or PE) usually is employed when clayey or silty sediments are encountered. The samples are obtained by pressing a piston equipped plastic (butrate) tube (2-7/8"I.D.-3"O.D) into the sediment. Butrate tubes are employed to prevent chemical contamination or significant physical alteration of the samples. Tube samples are drained of surface floc, sealed, and refrigerated at 34°F (1.1°C) before shipment to the laboratory.

A gravity coring device with controlled free fall, containing a plastic tube with or without piston, is used when refusal is encountered while pressing butrate tubes alone, or when sampling in deep channels and divers cannot be employed to press tubes. Samples obtained by gravity corer are handled in the same manner as all other tube samples before shipment. Samples obtained by Kullenberg coring are designated K or KE. Other gravity cores are designated PF.

GRAB SAMPLING

Grab sampling usually is employed when sands and gravels are encountered and when attempts at tube sampling result in repeated refusals. Grab sampling by NED sampling crews is done using a Petterson Dredge sampler. Grab samples are designated G or GE. All grab samples are sealed in airtight plastic bags after removing most air bubbles, and are refrigerated at 34°F (1.1°C) before shipment to the laboratory.

BIOASSAY SAMPLING

Sampling for bioassays usually entails grab sampling regardless of the type of sediment encountered. Grab samples for bioassays are designated GEB. Bioassay samples are not refrigerated or preserved in any manner, but must be sealed and transported to the testing laboratory within 48 hours of sampling.

WATER SAMPLING

Water samples for elutriate testing are taken at each corresponding sediment sample site immediately beneath the surface, stored in plastic containers and refrigerated at 34°F before shipment. Water samples used for PCB-elutriate testing are shipped and stored in one gallon glass containers. Water samples used for bioassay testing are taken and stored in the same manner as those for the elutriate test but are not refrigerated and must be delivered for testing within 48 hours. Bioassay water samples are taken at each corresponding sediment sampling station at the dredge site, control site and dump area reference site.

PCB-DDT SAMPLING

Sampling for PCB-DDT testing shall be performed at least at one station in each project. Larger projects require more stations. Three tube samples are taken at each station to provide sufficient sample to enable testing at a level of parts per trillion. Testing is to be performed on a composite sample consisting of a mix from three different levels in each of the three tubes, 0-3", 12-14", and 24-26". All tubes are drained of surface floc, sealed, and refrigerated before shipment to the laboratory.

SAMPLE DESIGNATION

SAMPLE TYPE	OLD NOMENCLATURE	NEW NOMENCLATURE
GRAB SAMPLES		
Smith-MacIntyre	GE	GS
Petterson Dredge	GE	GE
*Ponar	--	GP
*VanVeen	--	GV

NOTE: Grab samples taken by New England Division sampling crews are obtained using either a Petterson dredge sampler or a Smith-MacIntyre grab sampler. A suffix "B" is added to grab samples taken for biological testing.

TUBE SAMPLES		
Pressed Tube	P or PE	PE
Kullenberg corer	K or KE	PK
Other Gravity corers -	--	PF

- Free Fall

*Different sampling devices are used by other agencies which submit samples to the NED laboratory for testing.

NOTE: A suffix R() denotes a composite sample taken over a reach. The number in parenthesis after the R is the number of sampling stations along the reach used to obtain the sample.

NEW ENGLAND DIVISION

ENVIRONMENTAL TESTING PROGRAM

PHYSICAL TESTING

The extent of physical testing depends upon what type of sample is taken (grab, tube, etc.) and the nature of the material to be tested. All samples undergo a visual classification and sieve analysis for grain size distribution. Samples which show greater than fifteen percent fine particles (silts and or clays) also undergo hydrometer analysis to determine grain size distributions on a more detailed scale. All samples undergo analysis to determine specific gravity.

Tube samples containing greater than fifteen percent fine particles are tested for wet and dry unit weights, Atterberg limits, moisture content, and percent solids.

BULK CHEMICAL TESTING

Bulk chemical testing is undertaken on all samples which are shown to contain greater than fifteen percent fines. Samples are analyzed at the top three inches of a tube sample for volatile solids (both EPA and NED methods), chemical oxygen demand, Kjeldahl nitrogen, percent carbon-hydrogen-nitrogen, oil and grease content and radioactivity. Heavy metals analysis is performed on a sample taken from 0-3 inches and at a 12-14 inch depth within each tube. Tubes of insufficient length to be tested at 12-14 inches are tested at the bottom 2 inches. Metals tested are mercury, lead, zinc, arsenic, cadmium, chromium, copper, nickel, and vanadium. Other metals (silver, selenium, barium, tin, etc.) are tested depending on special local conditions such as type of industry or geologic setting.

ELUTRIATE TESTING

Elutriate testing is employed as an indicator of the amount of nutrients and or pollutants that may be released to the water column during dredging and dumping operations. One part sediment is mixed with four parts dredge site water and shaken for 30 minutes before it is allowed to settle for one hour. After settling, the mix is centrifuged and filtered prior to testing. The elutriate is then tested for concentration of nutrients and the same metals examined in the bulk chemistry test. The nutrients consist of nitrate nitrogen, nitrite nitrogen, sulfate, total and ortho phosphorus, and oil and grease content. A procedure for the statistical comparison of elutriate test results with bulk sediment values remains to be developed.

ORGANOHALOGEN TESTING

Testing for concentrations of polychlorinated biphenyls (PCB's) and DDT for most major harbors and several small projects within the New England Division was done on the upper three inches of sediment in a tube sample and measured in parts per billion until 1980. PCB and DDT testing is performed on composite samples taken from three levels in each of three tubes from a site starting in June 1980. The composite sample is tested to a level of parts per trillion in the elutriate test for both the mix and virgin dredge site water. Sediment from the same composite sample undergoes bulk PCB-DDT testing at a level of parts per billion.

PHYSICAL PARAMETERS

Grain Size Distribution Curve

All samples tested for physical parameters undergo a mechanical sieve analysis to determine grain size distribution for a random split of the sample. The numerical data are plotted on a logarithmic scale to yield a grain size distribution curve. A normal curve will have only one mode or peak. A bimodal or polymodal curve indicates a poorly sorted sediment which was influenced by more than one major factor during its desposition. The value for "percent fines" refers to the amount of silts and/or clays in a sample split. This is measured by determining what percentage of the sample passed through a #200 U.S. Standard seive (0.074 mm mesh). Samples which show less than 15 percent fines are considered granular material and do not undergo chemical testing.

Soil Classification

All samples are visually examined and dominant and sub-dominant soil types are determined according to the Unified Soil Classification system of the Corps of Engineers.

Atterberg Limits

Atterberg limits are an arbitrary means of measuring the ability of a sediment to withstand mechanical stress expressed in terms of water content in percent dry weight of sample. Chemistry, mineralogy and other variables will influence the behavior of a sediment subjected to changes in water content. These parameters are helpful in determining the suitability of sediment for different disposal alternatives or for use in landfills and construction.

The liquid limit is the water content (in percent dry weight of sample) immediately above which a split of sediment will begin to flow when subjected to a standard test of stress. This value is the lower limit of the sediment's liquid state or the upper limit of its plastic state. The plastic limit is the water content (in percent dry weight of sample at which the soil will crumble when rolled into thin threads. This value is the lower limit of the sediments plastic state. The plastic index is expressed as the difference between the liquid and plastic indices and is a measure of the plasticity of the sediment and indicator of how large a range of stress it can be subjected to without deformation.

Specific gravity is a rough measurement of the density of the solid portion of a sediment expressed as a ratio of its density to that of distilled water.

Unit weights are another means of expressing the density of a sediment. It is the weight of sediment per unit volume expressed in pounds per cubic foot for both the undisturbed (wet) sample and for the same sample when completely dried. Unit weights may only be determined accurately for tube samples which are subjected to only minor physical alteration during sampling operations.

Percent solids in a sample is a measure of that weight percentage of the total natural (wet) sample which is solid material (the percentage which remains after drying).

Moisture content is a measure of that portion of a sediment sample which is water, expressed as a percentage of the dry weight portion of the sediment sample.

CHEMICAL PARAMETERS

Chemical Oxygen Demand (COD). A measure of the quantity of oxidizable organic compounds in a sample. COD serves as an indicator of possible polluting material being present. In addition, this procedure can be used in the chemical characterization of sediment from a particular area.

Total Kjeldahl Nitrogen (TKN). A measure of the quantity of ammonia and organic nitrogen present. Organic nitrogen includes that found in proteins, urea, and many synthetic organic compounds. It however, does not include nitrate or nitrite. TKN is used as an indicator of the possible presence of sewage and industrial effluents.

Oil and Grease. A screening procedure which determines the quantity of materials extractible in Freon. These include sulfur and other compounds in addition to oil and grease. Oil and grease materials include cooking oils, fats, and paraffins as well as industrial oils. This procedure can indicate the possible presence of polluting oils, which shall be confirmed by the use of more sophisticated methods. There is no inclusive criterion for oil and grease at this time.

Mercury. Toxic to man and marine life. It can be concentrated in fish and invertabrate tissues. In addition, bacterial action can convert inorganic mercury compounds to methyl mercury which is 100 times more toxic. 0.10 ug/l is the Environmental Protection Agency (EPA) criterion for marine aquatic life as applied to sea water. The American Fisheries Society has suggested that this criterion be revised to include different forms of mercury (e.g. methyl mercury).

Arsenic. Arsenic and its compounds have proven to be toxic to humans and some marine life. 50 ug/l is the EPA criterion in drinking water. The American Fisheries Society suggests that the different forms of arsenic be considered as they have different degrees of toxicity.

Lead. A toxic material where cases of human poisoning are well documented. Fish and other marine life can concentrate this element in their tissues. 50 ug/l is the EPA criterion for domestic water supply. The American Fisheries suggests 4 ug/l be applied to marine water.

Copper. Essential for metabolic functions for plants and animals. Not considered a threat to the environment in elevated concentrations, but under certain conditions (low alkalinity for example) high concentrations of copper compounds have been toxic to some fish. Copper can be used for chemical characterization of sediment from a particular harbor. EPA criterion is 1,000 ug/l for water supplies. The American Fisheries Society suggests criterion of 5-15 ug/l in sea water.

Zinc. Essential and beneficial element in human metabolism. It can be an indicator of possible industrial pollution in which toxic materials are present. Studies have found that high quantities of zinc compounds can be toxic to some aquatic animals. Zinc can be used for chemical characterization of sediment from a particular harbor. The EPA criterion is 5,000 ug/l for water supplies. The American Fisheries Society suggests 50 ug/l be applied to sea water.

Nickel. Not considered a dangerous material. However, nickel in large quantities can indicate the presence of industrial wastes that could contain harmful materials. High quantities of nickel have been shown to be injurious to some plants and fish. Levels of nickel 100 ug/l or less are considered safe to plants and organisms. The American Fisheries Society believes that the 100 ug/l level is too high for marine water and suggests further studies be made.

Cadmium. Has proven to be a toxic material to both humans and marine life. The EPA criterion for marine water is 5.0 ug/l.

Chromium. Is considered an essential material for humans. Very common in nature (air, soil, foods and biological systems). Hexavalent chromium has shown to be toxic to some laboratory animals and cause respiratory effects in humans if injested in large quantities. 100 ug/l in water is the EPA criterion for aquatic life as total chromium. The American Fisheries Society suggests that the criterion for sea water be below 50 ug/l as Cr+6.

Vanadium. Little background material was found which related to any toxic properties of Vanadium. Vanadium pentoxide in large quantities did cause some adverse affects on humans (respiratory problem). Vanadium in elevated levels is not considered a serious problem. It can indicate the possible presence of industrial effluents which could contain harmful materials.

Carbon - Hydrogen - Nitrogen (C-H-N). A measurement of the total carbon, total hydrogen and total nitrogen content of a sample material. C-H-N values are used for physical and chemical classification of bottom sediments.

Polychlorinated Biphenyls (PCB). Used in electrical products. Many cases of adverse effects on animal life have been documented. The EPA criterion for aquatic life is 0.001 ug/l in water. The American Fisheries Society suggests 0.0001 ug/l be applied to sea water or 0.1 ug/g in fish tissue.

DDT. A pesticide that accumulates in the food chain as it can be concentrated in fish and invertabrate tissue. There are many studies confirming its adverse effects on animal life. The EPA criterion for aquatic life is 0.001 ug/l in water. The American Fisheries Society suggests the lowering of the criterion to 0.0001 ug/l.

TABLE I

SEDIMENT ANALYSIS

PARAMETER	TYPE METHOD	REFERENCE	LOWER LIMIT
Chemical oxygen demand (COD)	titrimetric	2	50 ppm (parts per million)
Total Kjeldahl Nitrogen (TKN)	block digested , automated	2	50 ppm
Oil and grease	extraction, gravimetric	3	20 ppm
Arsenic (As)	gaseous hydride, atomic absorption spectrophotometry (AAS)	2	0.5 ppm
Cadmium (Cd)	acid digestion - AAS	1	1 ppm
Chromium (Cr)	acid digestion - AAS	1	1 ppm
Copper (Cu)	acid digestion - AAS	1	1 ppm
Lead (Pb)	acid digestion - AAS	1	1 ppm
Mercury (Hg)	acid digestion flameless AAS	2	0.2 ppm
Nickel (Ni)	acid digestion - AAS	1	1 ppm
Vanadium (V)	acid digestion - AAS	1	10 ppm
Zinc (Zn)	acid digestion - AAS	1	1 ppm
Polychlorinated biphenyls (PCB)	extraction - gas chromatography	Federal Register 3 Dec 79 Volume 4, #233 EPA	0.05 ppm
DDT	extraction - gas chromatography	" "	0.002 ppm
Carbon-hydrogen-nitrogen (C-H-N)	combustion instrumentation	owners manual	0.01%

The current test methods used for obtaining chemical data are from updated procedure manuals recommended by the following publications:

- "National Handbook of Recommended Methods for Water Data Acquisition", 1977.
- "Ecological Evaluation of Proposed Discharge of Dredge Material Into Ocean Water", Environmental Protection Agency (EPA)/Corps of Engineers, 1977.

The procedure manuals are:

Reference 1 - "Methods for Chemical Analysis of Water and Wastes", EPA, 1979.

Reference 2 - "Methods for Determination of Inorganic Substances in Water and Fluvial Sediments", Book 5, Chapter A1, U.S. Geological Survey, 1979.

Reference 3 - "Standard Methods for the Determination of Water and Waste Water", 14th Edition.

A description of the test methods is presented in Tables I and II.

MARINE SEDIMENT
ELUTRIATE TESTING

Tests performed by the New England Division Laboratory for projects within Long Island Sound and Fishers Island Sound :

Project	Test Date
Black Rock Harbor	May 1980
Branford Harbor	February 1974
Bridgeport Harbor	May 1980
Clinton Harbor	March 1978
Conn. River - Saybrook-North Cove	January 1975
Conn. River - Saybrook Shoals & Outer Bar	March 1977
Mianus River	June 1975
New Haven Harbor	December 1973
New Haven Harbor	October 1977
New Haven Harbor	July 1978
New London Harbor (Shaws Cove)	November 1978
Norwalk Harbor	December 1978
Norwalk Harbor	April 1979
Stamford Harbor	May 1975
Stamford Harbor	December 1976
Stamford Harbor (East branch)	August 1978
West River (New Haven)	February 1974

TABLE II

ELUTRIATE TESTING

PARAMETER	TYPE METHOD	REFERENCE	LOWER LIMIT
Nitrate nitrogen (NO_3^-N)	automated	1	0.02 ppm
Nitrite nitrogen (NO_2-N)	automated	1	0.002 ppm
Ortho phosphorus (PO_4-P)	manual colorimetric	1	0.01 ppm
Total phosphorus (PO_4-P)	manual colorimetric	1	0.01 ppm
Sulfate (SO_4)	turbidimetric	1	1 ppm
Oil and grease	solvent extraction gravimetric	1	5 ppm
Arsenic (As)	gaseous hydride - AAS	2	3 ppb (parts pe billion)
Mercury (Hg)	acid digestion flameless - AAS	2	0.5ppb
Lead (Pb)	solvent extraction - AAS	2	10 ppb
Zinc (Zn)	solvent extraction - AAS	2	5 ppb
Copper (Cu)	solvent extraction -AAS	2	10 ppb
Cadmium (Cd)	solvent extraction - AAS	2	1 ppb
Chromium (Cr)	solvent extraction - AAS	2	10 ppb
Nickel (Ni)	solvent extraction - AAS	2	20 ppb
Vanadium (V)	solvent extraction - AAS	2	10 ppb

PARAMETER	TYPE METHOD	REFERENCE	LOWER LIMIT
PCB	extraction gas chromato graphy	Federal Register 3 Dec 79 Volume 4, #233 EPA	0.001 ppb
DDT	extraction gas chromatography	" "	0.001 ppb

Quality Control procedures used by NED and contract laboratories are those described in the EPA publication "Handbook of Analytical Quality Control in Water and Wastewater Laboratories", 1979.

References for background material and chemical procedures:

(1) "Quality Criteria for Water." Environmental Protection Agency, 1976.

(2) "Chemical Analysis of Water and Wastes." Environmental Protection Agency, March 1979.

(3) "14th Edition Standard Methods for the Examination of Water and Waste Water," 1975.

(5) "A Review of the EPA Red Book: Quality Criteria for Water," American Fisheries Society: April, 1979.

BIOLOGICAL ANALYSIS

BIOASSAY

The effect on dumping dredge spoil on animals indigenous to the dumpsite is the primary focus of bioassay testing. The laboratory bioassay is used to determine the survivability of various different native species during and after dumping operations. The animals response in terms of mortality vs. time when exposed to the three phases of dredge material is compared to the same species' response to a control sediment known to be uncontaminated and reference sediment taken from the dumpsite.

A minimum of three dredge site sediment samples must be tested along with the control and reference sediments. Dredge site sediment test results (percentage of survivors) are compared to the control and reference site results for each of the three phases of disposed dredge spoil material (liquid, suspended particulate, and solid phases). The statistical comparison will show if there is any increase in mortality of the species exposed to the material to be disposed as compared to species exposed to an uncontaminated control sediment and the sediment already at the dumpsite. Results from the liquid and suspended particulate phases will indicate the impact of dredging upon the water column and pelagic animals. The results of the solid phase bioassay will indicate the effects of disposal on benthic (bottom dwelling) animals.

The animals to be used are acclimated in artificial seawater for at least three days prior to testing while the sediment samples are stored at 2-4^{o}C. Bioassays must be initiated within two weeks of sampling. All sediment is wet sieved through a 1 mm mesh using artificial sea water (30 ppt salinity).

The aquaria in which tests are run are kept in a closed room with a constant temperature maintained at 20± 1°C (the recommended summer testing temperature for the New England region).

Liquid phase bioassays are conducted on three species to assess response to 10%, 50%, and 100% of the liquid phase. Each test is replicated three times for each concentration. A total of nine liquid phase bioassaysare conducted for each of the three species with each sediment sample (control, reference, and three dredge site samples). The percentage of survivors is recorded over a 96 hour period (at 0, 4, 8, 24, 48, 72, and 96 hours).

Suspended particulate phase bioassays are conducted along the same lines as the liquid phase using the same species, and concentrations are reported in the same manner.

Solid phase bioassays are run for each of three species using five replicates of each sediment, or 25 bioassays for each species. The animals are exposed for ten days, after which the percentage of survivors is recorded. Animals which survive the solid phase bioassay are frozen to preserve them for bio-accumulation tissue analysis.

BIOASSAYS AND BIOACCUMULATION STUDIES PERFORMED FOR THE NEW ENGLAND DIVISION

All bioassays and bioaccumulation studies are performed according to the methods in the Implementation Manual for Section 103 of Public Law 92-532 (Marine Protection, Research, and Sanctuaries Act of 1972) entitled "Ecological Evaluation of Proposed Discharge of Dredged Material into Ocean Waters" (July 1977).

HARBOR	BIOASSAYS TESTING LABORATORY	REPORT DATE
Black Rock Harbor, CT	Energy Resources Co. (ERCO)	Jan. 1980
Boston Harbor, MA	New England Aquarium	May 1980
Bridgeport Harbor, CT	ERCO	Jan. 1980
Fall River Harbor, MA-RI	New England Aquarium	May 1980
Island End River, MA	ERCO	May 1979
Lynn Harbor, MA	ERCO	Dec. 1979
Mystic River, MA	Normandeau Associates	Jan. 1979
New Haven Harbor, CT	Battelle	June 1978
New London, CT (Shaws Cove)	ERCO	Nov. 1978
Norwalk Harbor, CT	JBF Scientific Corp.	Aug. 1978
Norwalk Harbor, CT	ERCO	Aug. 1979
Norwalk Harbor, CT	New England Aquarium	May 1980
Pawtuxet Cove, RI	Raytheon Co.	Nov. 1978
Portland Harbor, ME	New England Aquarium	May 1980
Salem Harbor, MA	ERCO	Dec. 1979
Stamford Harbor, CT	Essex Marine Lab	Dec. 1978
Stamford Harbor, CT	New England Aquarium	May 1980
Wellfleet Harbor, CT	ERCO	Nov. 1979

BIOACCUMULATION

Bioaccumulation studies are used as a means of assessing the potential for significant elevation of tissue concentrations of contaminants in organisms exposed to the influence of dredged material. All of the benthic animals which survived the solid phase bioassay are used to determine if there is a significant difference in tissue contaminant levels in animals exposed to dredge spoil vs. animals exposed to control and reference sediment.

Tissue concentrations of mercury, cadmium, petroleum hydrocarbons, and organohalogens (PCB's and DDT) are examined. Concentrations are examined to assess the potential for accumulation of toxic compounds in the ecological food chain to levels which may be harmful to man without killing the intermediate organisms. The tissue samples should not include digestive tract tissues or any shells or skeletal material, since this would not be consumed by any predator and passed along up the food chain. Tissue analysis must be replicated five times for each species from each bioassay sediment.

BIOACCUMULATION STUDIES

HARBOR	TESTING LABORATORY	REPORT DATE
Black Rock Harbor, CT	ERCO	May 1980
Bridgeport Harbor, CT	ERCO	May 1980

SPECIES USED FOR BIOLOGICAL TESTING

CATEGORY	SPECIES
Liquid and suspended phases (pelagic organisms)	
Zooplankton	Acartia tonsa (copepod)
Mollusc or crustacean	*Neomysis Americana (mysid shrimp)
Fish	Menidia menidia (Atlantic Silverside)
Solid phase & bioaccumulation (benthic organisms)	
Crustacean	Palaemenètes pugio (grass shrimp)
Ínfaunal bivalue	Mercenaria mercenaria (hard clam)
Infaunal polychaete	Nereis Virens (sandworm)

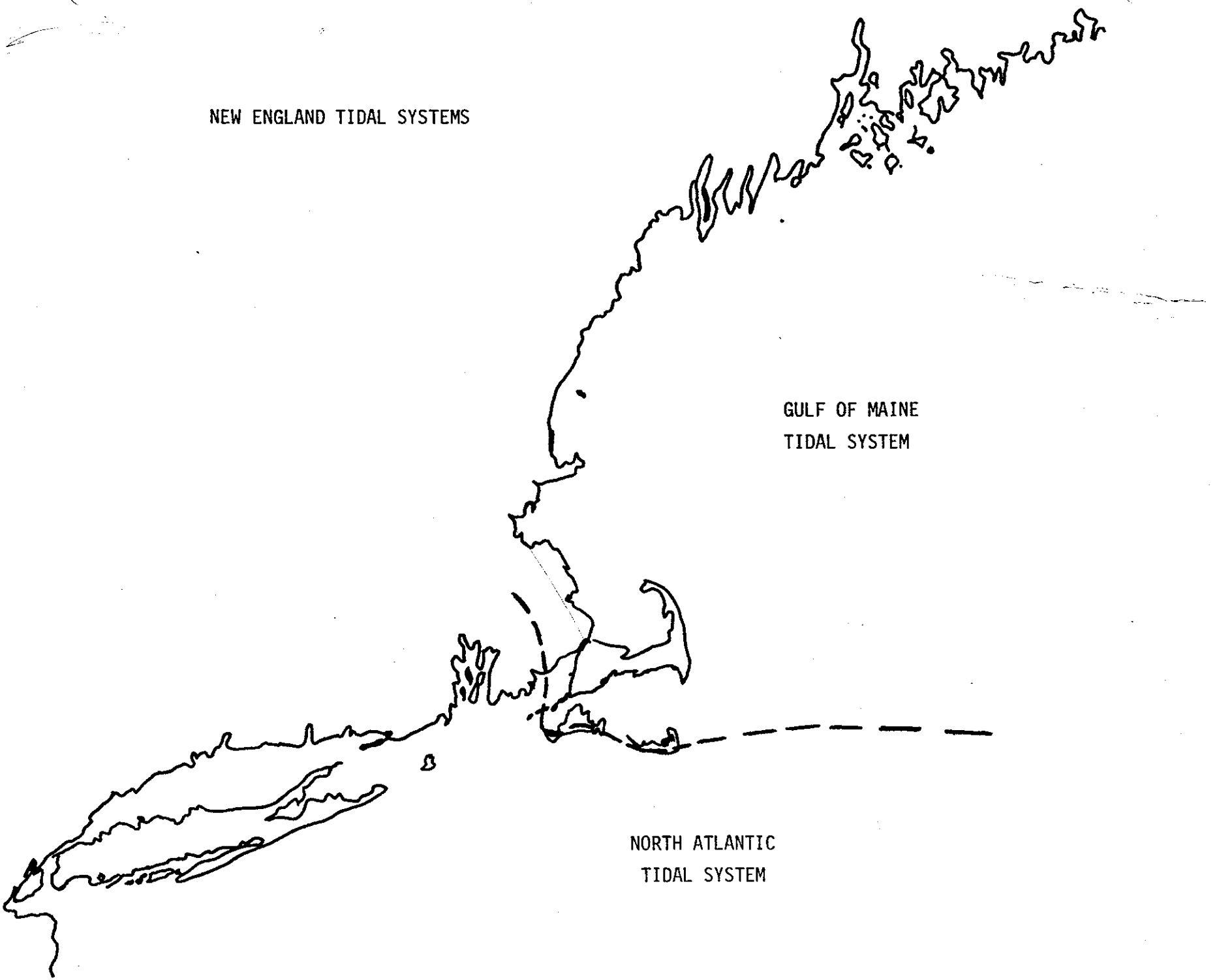
* Mysidopsis bahia has occasionally been used in the past. Various other species were also substituted for all categories during the early "trial" years of biological tesing. The species listed above are those presently used and are considered to be the most suitable for laboratory testing. Some previously used species were found to be unacceptable because of such problems as cannibalism and low tolerance to testing procedures.

STATISTICAL ANALYSIS (of bulk chemistry results)

Major differences in the geologic and oceanographic conditions throughout the region require separation of the New England coastal areas into two provinces - the North Atlantic Tidal System and the Gulf of Maine Tidal System. The data base for the North Atlantic Tidal System consists of 794 samples from 43 harbors, of which 244 are grab samples taken with either a Smith-McIntyre or a Petterson Dredge sampler, and 550 are core samples taken either with a Kullenberg piston coring device or pressed butrate tube equipped with a piston. The Gulf of Main Tidal System data base consists of 648 samples from 71 harbors, of which 286 are grabs and 362 are cores. Computerization of the data base has provided a means for developing a classification system based on a mathematical/statistical comparison of marine and estuarine sediments from different New England rivers and harbors.

A statistical analysis of all samples within each tidal system was performed and yielded means and standard deviations for each of the 20 chemical parameters for which marine sediment samples are analyzed by the New England Division laboratory (see Table 1). Every test result for each parameter tested from each sample has been statistically compared to the data base for its representative tidal system. Test result values are classified according to where they fall in relation to the mean value, the mean value plus one standard deviation (1σ), and the mean plus two standard deviation(2σ). Test result values which fall between the mean value and the mean value plus 1σ are considered to be above average values. Values which fall above the mean value plus 2σ are considered abnormally high.

Bulk chemical test result averages for individual projects are shown for each sampling effort. Two average values for each parameter are shown for each sampling effort. One average value is shown for organic silts


NEW ENGLAND TIDAL SYSTEMS
GULF OF MAINE
TIDAL SYSTEM
NORTH ATLANTIC
TIDAL SYSTEM

and/or clayey (> 50% fines) and another for sandy and/or gravelly samples(< 50% fines).

Test results for physical parameters from individual projects are presented for each sample. Project means of test results from each sampling effort and for all sampling efforts combined are also shown.

GULF OF MAINE TIDAL SYSTEM

STATISTICAL SUMMARY

Parameter	No. of Cases	Mean	Standard Deviation	Mean Plus One Stand. Deviation	Mean Plus Two Stand. Deviation
% Volatile Solids - EPA	553	5.593	5.322	10.915	16.237
% Volatile Solids - NED	393	4.372	4.992	9.364	14.356
% Tot. Vol. Solids - EPA	350	8.776	7.321	16.097	23.418
PPM Chem. Oxygen Dmnd	383	74,541	73,464	148,005	221,469
PPM Tot. Kjeldahl Nit.	382	2,163	2,231	4,394	6,625
PPM Oil & Grease	383	2,532	3,829	6,361	10,190
PPM Mercury	597	0.573	1.210	1.783	2.993
PPM Lead	598	83.2	100.8	184.0	284.8
PPM Zinc	598	134.5	151.0	285.5	436.5
PPM Arsenic	598	6.98	7.66	14.64	22.3
PPM Cadmium	597	3.12	6.25	9.37	15.6
PPM Chromium	597	112.0	225.4	337.4	562.8
PPM Copper	591	83.2	129.4	212.6	342.0
PPM Nickel	598	36.3	27.7	64.0	91.7
PPM Vanadium	598	60.9	58.9	119.8	178.7
% Total Carbon	165	3.342	2.172	5.514	7.686
% Hydrogen	165	0.692	0.456	1.148	1.604
% Nitrogen	165	0.388	0.363	0.751	1.114
PPB DDT	55	33.67	66.83	100.50	167.33
PPB PCB's	55	613.57	1033.3	1646.87	2680.17

STATISTICAL SUMMARY OF BULK SEDIMENT
PHYSICAL DATA FROM FEDERAL PROJECTS
WITHIN THE NORTH ATLANTIC TIDAL SYSTEM

Parameters	Observations	Range of Values		Mean	Standard Deviation
		Lowest	Highest		
GR. SIZE CURVE-MED (mm)	480	0.001	71.000	0.782	4.674
GR. SIZE CURVE-Q1	481	0.004	90.000	1.559	7.377
GR. SIZE CURVE-Q3	464	0.001	39.000	0.363	2.423
SRT. COEF	464	0.202	19.848	3.299	2.299
GR. SIZE CURVE = % FINES	475	0.000	100.000	52.828	38.400
LIQUID LIMIT	248	25.	246.	75.	34.
PLASTIC LIMIT	248	16.	113.	37.	15.
PLASTIC INDEX	248	3.	165.	38.	23.
SPEC. GRAV. SOLIDS	424	2.29	2.82	2.63	0.07
WET UNIT WGT. (PCF)	235	36.8	136.1	94.7	15.3
DRY UNIT WGT. (PCF)	235	8.6	113.7	51.2	19.8
PERCENT SOLIDS	553	2.9	93.9	56.1	19.2

STATISTICAL SUMMARY OF BULK SEDIMENT
PHYSICAL DATA FROM FEDERAL PROJECTS
WITHIN THE GULF OF MAINE TIDAL SYSTEM

Parameters	Observations	Range of Values		Mean	Standard Deviation
		Lowest	Highest		
GR. SIZE CURVE-MED (mm)	392	0.001	14.000	0.234	1.005
GR. SIZE CURVE-Q1	392	0.003	31.000	0.697	3.238
GR. SIZE CURVE-Q3	387	0.001	1.700	0.078	0.181
SRT COEF	386	0.494	44.721	3.253	2.980
LIQUID LIMIT	301	25.	221	86.	37.
PLASTIC LIMIT	301	17.	83.	42.	13.
PLASTIC INDEX	301	2.	172.	55.	26.
SPEC. GRAV. SOLIDS	401	2.190	2.790	2.61	0.10
WET UNIT WGT (PCF)	267	46.7	138.5	95.2	16.7
DRY UNIT WGT (PCF)	268	8.7	118.	51.8	25.
PERCENT SOLIDS	569	7.9	88.6	51.2	18.4

Sampling and testing methodology changes and supplements with updated statistics, data, and maps for individual projects will be published annually.

Basic data packages for individual projects are available. The data consists of physical and chemical test results from individual sample stations along with a statistical summary of the results. Data packages and copies of bioassay reports may be obtained by written request to:

Marine Science Unit, Bldg. 115-S
U.S. Army Corps of Engineers
New England Division
424 Trapelo Road
Waltham, Massachusetts 02154

PART 2

ENVIRONMENTAL DATA SUMMARY

FOR FEDERAL NAVAGATION PROJECTS

WITHIN LONG ISLAND SOUND

AND FISHERS ISLAND SOUND

BLACKROCK HARBOR

ENVIRONMENTAL SAMPLING AND TESTING

BLACK ROCK HARBOR

Black Rock Harbor, Connecticut is a small commercial port on central Long Island Sound. The federal project consists of an 18 foot channel from the Sound north through Black Rock Harbor and into Cedar Creek. Environmental sampling and testing was undertaken in 1973, 1976, and 1979.

Sampling in 1973 consisted of five tube samples. The sample taken in the upper most portion of the project channel showed abnormally high values (values in excess of two standard deviations above the mean of all North Atlantic Tidal System samples) for all parameters tested. Similar values were found throughout the project for Zinc, Chromium, Copper, Nickel and Vanadium. One sample in the central portion of the project showed similar values for cadmium, arsenic and kjeldahl nitrogen. Samples taken throughout the project and showed moderately high values (values in excess of 1 standard deviation above the mean) for volatile solids, kjeldahl nitrogen, lead, zinc, arsenic, chromium, copper, nickel and vanadium. Sampling undertaken in 1976 showed a similar pattern of parameter concentrations to those observed in 1973.

Sampling in 1976 consisted of five tube samples and one grab sample which was taken in the far upper end of the project. The two tube samples taken in the far upper end of the project showed abnormally high values for volatile solids, kjeldahl nitrogen, mercury, zinc, cadmium, chromium, copper, nickel, vanadium and percent carbon. Samples taken thr oughout the upper two-thirds of the project channel showed moderately high values for volatile solids, chemical oxygen demand, lead, zinc, cadmium, chromium, copper, nickel, vanadium and percent carbon.

Sampling in 1979 consisted of seven tube samples taken over the entire length of the project. Grab samples for bioassay were also taken at three of the sites. All samples underwent bulk physical and chemical testing as well as elutriate analysis. The four samples taken in Cedar Creek showed abnormally high values for volatile solids, chemical oxygen demand, oil and grease, mercury, cadmium, chromium, copper, nickel and zinc. The two uppermost samples in Cedar Creek also showed abnormally high values for lead and moderately high values for kjeldahl nitrogen. The sample taken in the upper end at 1 3/4 miles up the channel (PE-2) showed an abnormally high value for kjeldahl nitrogen and moderately high values for vanadium. The two uppermost samples in the outer harbor (PE-4,5) showed moderately high values for kjeldahl nitrogen, mercury, zinc, copper and nickel.

BLACK ROCK HARBOR & CEDAR CREEK

Environmental Sampling History

June 1973 - Bulk Sediment Analysis (5)	KE-14, PE-18,19,20,21 Lab Series: 100-115-12, 100-116-20-26 Tests Run: Unit Weights, Limits, COD, Volatile Solids, 2 levels each sample - Hg, Pb, Zn, As, Cd, Cr, Cu, Ni, V, DDT(1), PCB(1).
July 1975 - Bulk Sediment Analysis (6)	PE-1-5, GE-6 Lab Series: 100-202-2-8 Tests Run: Unit Weights, Limits, COD, Volatile Solids, TKN, 11 each - Hg, Pb, Zn, As, Cd, Cr, Cu, Ni, V, C-H-N's, DDT(1), PCB(1), grain size analysis.

BLACK ROCK HARBOR & CEDAR CREEK

Environmental Sampling History

(Continued)

December 1979 -	Bulk Sediment Analysis (7)	PE-1-7 Lab Series: 100-303-1-7 Tests Run: Unit Weights, Limits, COD, Volatile Solids, TKN, O&G, 2 levels each - Hg, Pb Zn, As, Cd, Cr, Cu, Ni, V, C-H-N's (8), PCB(1), DDT (1), grain size analysis
	Elutriate Analysis	Standard Elutriate analysis using EW-1-7
	Bioassay, Jan 1980 (3) ERCO	GEB-2,5,6

BLACK ROCK HARBOR

Parameter	Organic Silts			Sands & Gravels		
	1973	1975	1979	1973	1975	1979
% Volatile Solids - EPA	14.43	8.92	12.97	none	none	
% Volatile Solids - NED	11.22	8.72	10.81			
% Total Volatile Solids	20.7	16.92				
PPM Chem. Oxygen Demand	197,600	159,400	218,286			
PPM Total Kjeldahl Nitrogen	7302	3880	4,800			
PPM Oil and Grease	4852	11853	17,496			
# of tests on parameters above / # of tests on parameters below	(5)/(10)	(6)/(11)	(7)/(14)			
PPM Mercury	1.637	1.150	2.578			
PPM Lead	307.4	305.8	485.7			
PPM Zinc	1100.9	637.5	1940.2			
PPM Arsenic	12.4	9.04	1.97			
PPM Cadmium	30.3	12.92	24.6			
PPM Chromium	1289	749.4	1131.5			
PPM Copper	1237	1063.8	2906.6			
PPM Nickel	149.1	109.3	230.7			
PPM Vanadium	141.3	98.3	67.1			
% Total Carbon		5.992	6.730			
% Hydrogen		0.998	1.013			
% Nitrogen		0.403	0.433			
PPB DDT	.1160	0.007				
PPB PCB	2010	900.0				

BLACK ROCK HARBOR

SUMMARY OF ELUTRIATE TEST RESULTS

* Number in ( ) is number of cases

TEST PARAMETER	DREDGE SITE WATER		SEDIMENT ELUTRIATE	
	1980 (7) *		1980 (21)	
Nitrite Nitrogen (PPM)	0.131		0.035	
Nitrate Nitrogen (PPM)	1.024		0.092	
Sulfate (SO_4) (PPM)	1814		1825	
Oil & Grease (PPM)	1.00		1.20	
Phosphorus - Ortho (PPM)	0.210		0.160 (18)	
Phosphorus - Total (PPM)	0.240		0.085 (20)	
HEAVY METALS				
Mercury ** (PPB)				
Lead	0.005		0.005	
Zinc	0.047		0.064	
Arsenic	0.002		0.002	
Barium				
Berylium				
Cadmium	0.006		0.005	
Chromium	0.010		0.010	
Copper	0.0086		0.0076 (20)	
Nickel	0.040		0.032 (17)	
Selenium				
Silver				
Vanadium	0.025		0.025 (15)	
ORGANOHALOGENS				
Total PCB, (ppt)	11,050 (2)		22,000 (1)	
Total DDT, (ppt)				

** All heavy metal values are in parts per million except Mercury.

BLACK ROCK HARBOR Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
KE-14-73	OH	N	67.8	108	53	55	2.33	86.2	20.2	17.2	
PE-18	OH	N	76.3	57	36	21	2.63	98.1	42.2	36.6	
PE-19	OH	N	96.3	138	67	71	2.48	71.7	21.1	25.8	
PE-20	OH	N	97.4	145	66	79	2.63	104.4	26.0	24.1	
PE-21	OH	N	98.3	175	67	108	2.40	70.4	14.8	21.3	
Mean 1973			87.2	124.6	57.8	66.8	2.49	86.2	24.9	25.0	
PE-1-76	M	N	78.7	69	37	32	2.62	92.7	46.5	49.97	
PE-2-76	M	N	81.8	93	43	50	2.61	89.2	41.5	38.71	
PE-3-76	M	N	96.6	119	50	69	2.55	80.8	31.1	36.28	
PE-4-76	M	N	96.8	165	65	100	2.43	73.5	20.6	25.92	
PE-5-76	M	N	64.6	70	37	33	2.57	85.1	38.4	48.70	
GE-6-76	M			58	37	21				51.94	
Mean 1976			83.7	95.7	44.8	50.8	2.556	84.3	35.6	41.92	
PE-1-79	OH	B	70.0	98	43	55	2.55	72.2	27.5	30.5	163.1
PE-2	OH	N	89.7	158	57	101	2.35	70.2	19.0	31.0	270.0
PE-3	OH	N	54.0	50	34	17	2.68	99.3	54.4	56.5	82.7
PE-4	OH	N	88.5	102	45	58	2.60	80.7	32.0	34.5	152.4

BLACK ROCK HARBOR Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
PE-5	OH	B	67.0	104	43	61	2.57	78.9	33.0	49.0	138.9
PE-6-79	OH	N	64.8	102	43	59	2.44	78.6	30.8	33.5	155.4
PE-7	S	N	33.7	106	44	62	2.36	75.0	32.5	54.5	130.8
Mean 1979			66.8	102.9	44.1	59	2.507	79.3	32.7	41.36	156.2
Project Mean			77.8	106.5	48.2	58.5	2.516	82.8	31.3	37.00	156.2

BRANFORD HARBOR

ENVIRONMENTAL SAMPLING AND TESTING

BRANFORD HARBOR

Branford Harbor, CT, is a mainly recreational project located on central Long Island Sound about five miles east of New Haven Harbor. The federal project consists of an 8.5 foot channel extending north from the Outer Harbor about 2.8 miles up the Branford River to the bridge at CT Route 146.

Environmental sampling and testing was undertaken in 1972, 1973, and 1974. Sampling in 1972 consisted of seven tube samples taken over the length of the project channel. One sample taken from the far upstream end of the project exhibited abnormally high values for zinc, vanadium, and arsenic. Arsenic values were also found to abnormally high throughout the Branford River (upstream from Branford Point). The sample taken furthest upstream also showed an above average value for chromium and volatile solids. Zinc values were shown to be above average in samples taken upstream from Branford Point.

Sampling in 1973 consisted of five tube samples which underwent elutriate analysis only.

Sampling in 1974 consisted of ten tube samples. Five samples were taken from the inner harbor, and five from a bend in the river about 0.5 miles upstream from Branford Point. One sample from the upstream group showed an abnormally high value for vanadium and the other four samples showed above average values for the same metal. One sample from this same group showed above average values for volatile solids, zinc and arsenic. The samples taken from the inner harbor showed abnormally high values for percent total nitrogen and above average values for vanadium and percent hydrogen. One sample from this group exhibited above average values for percent carbon and DDT concentration.

BRANDFORD HARBOR

Environmental Sampling History

August 1972 - Bulk Sediment Analysis (7)	PE-1-7 Lab Series: 100-76-1-14 Tests Run: Unit Weights, Limits, Volatile Solids, COD, TKN, 2 levels each heavy metal - (Hg, Pb, Zn, As, Cd, Cr, Cu, Ni, V), grain size analysis.
January 1974 - Standard Elutriate (5)	PE-1-5, EW-3 Lab Series: 100-128-1-6 Tests Run: Standard Elutriate Testing.
July 1974 - Bulk Sediment Analysis (10)	PE-1-10 Lab Series: 100-149-1-20 Tests Run: Unit Weights, Limits, Volatile Solids, COD, TKN, 2 levels each heavy metal (Hg, Pb, Zn, As, Cd, Cr, Cu, Ni, V) C-H-N's (10), DDT(1), PCB(1), grain size analysis.

BRANFORD HARBOR

Parameter	Organic Silts			Sands & Gravels		
	1972	1974		1972	1974	
% Volatile Solids - EPA	8.66	7.10		none	none	
% Volatile Solids - NED	6.86	5.33				
% Total Volatile Solids	12.48	9.85				
PPM Chem. Oxygen Demand	113,914	86,900				
PPM Total Kjeldahl Nitrogen	2,564	2,716				
PPM Oil and Grease	8,089	2,070				
# of tests on parameters above # of tests on parameters below	(7)/(14)	(10)/(20)				
PPM Mercury	0.334	0.715				
PPM Lead	104.4	86.9				
PPM Zinc	675.8	337.9				
PPM Arsenic	27.9	8.15				
PPM Cadmium	2.53	2.44				
PPM Chromium	207.3	157.3				
PPM Copper	245.4	198.9				
PPM Nickel	41.1	50.6				
PPM Vanadium	75.3	91.3				
% Total Carbon		2.98				
% Hydrogen		1.28				
% Nitrogen		1.29				
PPB DDT		460				
PPB PCB		0.007				

BRANFORD HARBOR

SUMMARY OF ELUTRIATE TEST RESULTS

* Number in ( ) is number of cases

WATER

TEST PARAMETER	NEW HAVEN DUMP SITE * 1974 (1)		SEDIMENT ELUTRIATE 1974 (10)	
Nitrite Nitrogen (PPM)	0.000		0.005	
Nitrate Nitrogen (PPM)	0.190		0.174	
Sulfate (SO_4) (PPM)	2100		1854	
Oil & Grease (PPM)	10.70		8.00	
Phosphorus - Ortho (PPM)	0.130		0.110	
Phosphorus - Total (PPM)	0.360		0.580	

HEAVY METALS

Mercury ** (PPB)	0.00		0.29	
Lead	0.020		0.020	
Zinc	0.025		0.015	
Arsenic	0.004		0.006	
Barium				
Berylium				
Cadmium	0.002		0.002	
Chromium	0.005		0.005	
Copper	0.005		0.0034	
Nickel	0.010		0.0145	
Selenium				
Silver				
Vanadium	0.020		0.020	

ORGANOHALOGENS

Total PCB, (ppt)				
Total DDT, (ppt)				

** All heavy metal values are in parts per million except Mercury.

BRANFORD HARBOR Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
PE-1-74	OH	N	98.5	117	54	63	2.62	81.1	27.5	28.6	
PE-2	OH	N	98.7	113	49	64	2.59	81.8	29.6	28.6	
PE-3	OH	N	98.4	122	55	67	2.62	75.3	26.8	30.1	
PE-4	OH	N	98.9	114	61	53	2.61	79.7	28.4	33.6	
PE-5	OH	N	99.5	100	46	54	2.61	82.5	32.0	39.9	
PE-5 Lower	OH	N	93.1	51	34	17	2.66	96.8	53.6	39.1	
PE-6	OH	N	95.3	58	36	22	2.65	94.6	47.5	46.0	
PE-7	OH	N	92.3	56	34	22	2.65	97.2	53.1	32.5	
PE-8	OH	N	96.1	68	40	28	2.66	97.3	54.3	57.5	
PE-9	-	-								57.3	
PE-10	OH	N	84.5	40	31	9	2.72	108.5	68.9	58.8	
Mean 1974			95.53	83.9	44.0	39.9	2.64	89.5	42.2	41.1	
PE-1-76	OL	N	93	40	30	10	2.683	103.26	61.62	44.37	
PE-2	OH	N	97	97	53	44	2.589	88.03	35.27	34.76	
PE-3	OH	N	99	90	42	48	2.639	84.03	34.65	36.97	
PE-4	OH	N	99	115	46	69	2.591	74.60	23.16	27.67	
PE-5	OH	N	97	130	63	67	2.590	92.27	25.85	17.08	
PE-6	OH	N	99	118	52	66	2.616	97.20	32.21	26.05	

BRANFORD HARBOR Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
PE-7	OH	N	98	107	50	57	2.619	94.71	34.59	32.10	
Mean 1976			97.4	99.6	48.0	51.6	2.618	90.59	35.34	31.29	
Project Mean			96.3	90.4	45.6	44.7	2.631	89.95	39.38	37.29	

BRIDGEPORT HARBOR

ENVIRONMENTAL SAMPLING AND TESTING

BRIDGEPORT HARBOR
(Main Harbor and Entrance Channel)

Bridgeport Harbor, CT, is a major commercial port on Western Long Island Sound. The federal navigation project in the main harbor consists of a 35 foot entrance channel and main harbor channel, an 18-foot anchorage on the west side of the inner harbor, a 27-foot on the west side of the outer harbor, a 25-foot anchorage on the east side of the outer harbor and a 35-foot turning basin at the entrance to Johnsons' River.

Environmental sampling and testing in the main harbor was undertaken in 1973, 1975, 1979 and 1980. Sampling in 1973 consisted of nine Kullenberg core samples taken from all sections of the project. Sample KE-15, from the 25-foot east anchorage showed abnormally high values for kjeldahl nitrogen and arsenic, and moderately high values for volatile solids, chromium, nickel and vanadium. Sample KE-16, taken from the 18-foot west anchorage showed abnormally high values for cadmium, chromium, and copper, and moderately high values for kjeldahl nitrogen, mercury, zinc, arsenic, nickel and vanadium. The sample taken opposite the entrance to the Yellow Mill Channel (KE-17) exhibited an abnormally high value for nickel and moderately high values for volatile solids, kjeldahl nitrogen, chromium and vanadium. The sample taken from the 35-foot turning basin (KE-13) showed moderately high values for arsenic, nickel and vanadium. Entrance channel sediments showed moderately high values for chromium and copper in the outer harbor, and nickel and vanadium outside the breakwaters.

Sampling in 1975 consisted of five tube samples taken in the inner harbor, one tube sample taken in the outer harbor (PE-6), and one grab sample taken in the entrance channel between the breakwaters (GE-7). Sample PE-5 taken near the entrance to the Peqoonnock River showed an abnormally high value for vanadium and moderately high values for volatile solids, percent total carbon, lead, chromium, nickel and copper. All inner harbor samples exhibited moderately high values for copper and chromium. Sample PE-4 taken from the north end of the 18-foot west anchorage also showed moderately high values for mercury, lead, zinc, and vanadium. Sample PE-3 taken near the entrance to the Yellow Mill Channel also showed moderately high values for nickel and PCB's. The samples taken in the outer section of the harbor and in the entrance channel showed no significantly high values for any parameters.

Sampling in 1979 consisted of eight tube samples. All samples showed abnormally high values for mercury. Sample PE-5, taken from the 35-foot turning basin also exhibited abnormally high values for cadmium and vanadium. Sample PE-7, taken from the northern end of the inner harbor also showed moderatley high values for volatile solids and zinc. Sample PE-8 taken at the east end of the inner harbor showed a moderatley high value for vanadium. None of the three samples taken from the entrance channel showed any significantly high values.

BRIDGEPORT HARBOR

Environmetal Sampling History

June 1973 - Bulk Sediment Analysis (16)	PE-1,2,3,4,5, GE-6,7,8, GE-9,10,11,12,13,15,16,17 Lab Series: 100-117-1-13, 100-116-1-10, 100-116-13-19 Tests Run: Unit Weights, Limits, Volatile Solids, COD, TKN, 2 levels -each heavy metal (Hg, Pb, Zn, As, Cd, Cr, Cu, Ni, V), PCB(1), DDT(1) (Yellowmill River), grain size analysis.
January 1975- Bulk Sediment Analysis (7)	PE-1-6, GE-7 Lab Series: 100-182-1-14 Tests Run: Unit Weights, Limits, Volatile Solids, COD, TKN, 13 each - Hg, Pb, Zn, As, Cd, Cr, Cu, Ni, V, C-H-N's (7), DDT(1), PCB(1), grain size analysis.

BRIDGEPORT HARBOR

Environmental Sampling History

(continued)

December 1979 - Bulk Sediment Analysis (8)		PE-1-8
		Lab Series: 100-205-2-16
		Tests Run: Unit Weight,
		Limits, COD, Volatile
		Solids, TKN, O&G,
		2 levels each - Hg, Pb,
		Zn, As, Cd, Cr, Cu, Ni,
		V, C-H-N's (8), PCB (2),
		DDT(2), grain size analysis
	Elutriate Testing	Standard elutriate
		test using EW-1-8
	Bioassay, Jan 1980	GEB-1,5,8
	ERCO	

BRIDGEPORT HARBOR

MAIN HARBOR

Parameter	Organic Silts			Sands & Gravels		
	1973	1975	1979	1973	1975	1979
% Volatile Solids - EPA	8.80	8,561	10.025	none	2.963	none
% Volatile Solids - NED	6.51	8,046	6.113		2,655	
% Total Volatile Solids	12.25	14,660			5,935	
PPM Chem. Oxygen Demand	114,375	136,601	106,500		47,100	
PPM Total Kjeldahl Nitrogen	4515	3989	3,600		945	
PPM Oil and Grease	10,556	6098	2,905		1810	
# of tests on parameters above / # of tests on parameters below	(8)/(16)	(5)/(10)	(8)/(15)		(2)/(3)	
PPM Mercury	0.699	1.150	2.80		0.360	
PPM Lead	144.1	276.4	125.3		56.7	
PPM Zinc	405.1	528.1	361.6		169.0	
PPM Arsenic	13.2	9.94	1.83		2.33	
PPM Cadmium	2.03	8.40	9.47		3.03	
PPM Chromium	411.7	471.7	147.7		110.7	
PPM Copper	579.7	730.1	105.5		221.7	
PPM Nickel	100.1	82.1	56.7		39.0	
PPM Vanadium	96.7	99.9	69.3		29.0	
% Total Carbon		4.404	3.500		1.30	
% Hydrogen		0.914	0.716		0.27	
% Nitrogen		0.409	0.353		0.025	
PPB DDT	50					
PPB PCB	80					

BRIDGEPORT HARBOR

SUMMARY OF ELUTRIATE TEST RESULTS

* Number in ( ) is number of cases

TEST PARAMETER	DREDGE SITE WATER		SEDIMENT ELUTRIATE	
	1980 (6) *		1980 (18)	
Nitrite Nitrogen (PPM)	0.004		0.021	
Nitrate Nitrogen (PPM)	0.168		0.118	
Sulfate (SO_4) (PPM)	2013		1959	
Oil & Grease (PPM)	2.17		1.11	
Phosphorus - Ortho (PPM)	0.065		0.115	
Phosphorus - Total (PPM)	0.073		0.242	
HEAVY METALS				
Mercury ** (PPB)				
Lead	0.005		0.005	
Zinc	0.005		0.006	
Arsenic	0.002		0.002	
Barium				
Berylium				
Cadmium	0.005		0.059 (17)	
Chromium	0.010		0.010	
Copper	0.0058		0.010	
Nickel	0.023		0.006	
Selenium				
Silver				
Vanadium	0.025		0.025	
ORGANOHALOGENS				
Total PCB, (ppt)	6,870 (3)		9,170 (3)	
Total DDT, (ppt)				

** All heavy metal values are in parts per million except Mercury.

BRIDGEPORT HARBOR Sample Main Harbor	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
KE-9-73	OH	N	77.4	84	39	45	2.59	91.8	47.6	39.1	
KE-9-Lower	CH	N	64.5	61	30	31	2.69				
KE-10	OH	N	90.1	99	44	55	2.51	93.7	30.6	29.0	
KE-11	OH	N	91.3	100	44	56	2.38	67.6	22.7	33.5	
KE-12	OH	N	56.4	71	36	35	2.62	70.9	38.5	60.1	
KE-13	OH	N	80.5	51	31	20	2.54	91.8	37.1	33.6	
MEAN-1973			76.7	77.7	37.3	40.3	2.56	83.1	26.5	39.1	
PE-1-75	M	N	80.0	96	43	53	2.58	75.4	27.6	36.10	
PE-2	M	N	85.3	97	48	49	2.60	88.0	35.8	38.92	
PE-3	M	N	94.1	133	53	80	2.62	85.0	33.0	33.07	
PE-4	M	N	92.9	119	52	67	2.58	73.1	26.9	34.84	
PE-5	M	N	95.0	138	53	85	2.48	73.4	23.4	33.40	
PE-6	S	N	35.0	49	31	18	2.70	108.4	69.9	61.50	
GE-7	S	N	28.3	43	30	13	2.68			66.95	
MEAN-1975			72.9	96.4	44.3	52.1	2.61	83.9	36.1	43.54	
PE-1-79	OH	B	58.5	64	30	34	2.67	86.9	47.0	42.0	85.2
PE-2	OH	N	86.0	90	43	47	2.64	78.1	31.4	39.0	148.6
PE-3	OH	N	92.5	106	44	62	2.64	73.5	26.4	45.0	179.0

BRIDGEPORT HARBOR Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
PE-4-79	OH	N	90.0	112	42	70	2.62	74.2	25.8	36.0	188.1
PE-5	OH	B	85.0	100	43	57	2.59	73.5	26.8	37.0	174.5
PE-6	OH	N	86.5	103	46	57	2.62	77.7	29.0	39.5	167.8
PE-7	OH	N	91.5	123	51	72	2.63	76.9	26.3	31.0	192.4
PE-8	OH	N	85.5	112	45	68	2.62	75.9	28.5	34.5	166.2
MEAN-1979			84.4	101.3	43	58.4	2.63	77.1	30.2	38.0	162.7
PROJECT MEAN			74.0	92.4	43.1	49.2	2.51	80.3	30.5	41.8	162.7

YELLOW MILL CHANNEL AND PEQUONNOCK RIVER
BRIDGEPORT HARBOR

The Yellow Mill Channel and Pequonnock River, at Bridgeport Harbor, CT, are chiefly utilized by commercial interests. The federal project in the Yellow Mill Channel consists of an 18-foot channel, 150 feet wide, extending about one mile north from the 35-foot main shipping channel. The federal project in the Pequonnock River consists of an 18-foot channel, varying in width from 200 feet at its junction with the 35-foot main harbor channel to 125 feet at its upstream limit 1.3 miles upstream from the main harbor.

Environmental sampling and testing in both projects was undertaken in 1973. Sampling in the Yellow Mill Channel consisted of two tube samples taken north of the Stratford Avenue bridge. Both samples exhibited abnormally high values for mercury, arsenic, cadmium, chromium, copper, nickel and vanadium. Sample PE-1 showed abnormally high values for lead and zinc while sample PE-2 showed only moderately high values for these metals. Both samples also exhibited moderately high values for volatile solids and kjeldahl nitrogen. Sample PE-1 also showed moderately high value for chemical oxygen demand.

Sampling in the Pequonnock River in 1973 consisted of three grab samples and one tube sample. Sample PE-5, taken above the Grand Street bridge showed abnormally high values for volatile solids, kjeldahl nitrogen, lead, zinc, chromium, copper, nickel and vanadium, and moderately high values for chemical oxygen demand mercury and cadmium. Sample GE-7, taken below the East Washington Avenue bridge, exhibited an abnormally high value for copper and moderately high values for lead and chromium.

YELLOW MILL CHANNEL AND PEQUONNOCK RIVER

BRIDGEPORT HARBOR

YM = Yellow Mill Channel PR = Pequonnock River

Parameter	Organic Silts			Sands & Gravels		
	PQ 1973	YM 1973		PQ 1973	YM 1973	
% Volatile Solids - EPA	15.79	13.135		4.714	None	
% Volatile Solids - NED	14.51	10.875		4.027		
% Total Volatile Solids	26.50	22.10		8.013		
PPM Chem. Oxygen Demand	257,000	212,000		72,233		
PPM Total Kjeldahl Nitrate	7,150	5,630		1,810		
PPM Oil and Grease	1,200	19,600		20,293		
#of tests on parameters above / #of tests on parameters below	(1)/ (2)	(2)/ (4)		(3)/ (3)		
PPM Mercury	2.20	6.25		0.233		
PPM Lead	919.5	966.3		278.3		
PPM Zinc	1,625.0	1,129.5		381.7		
PPM Arsenic	13.5	26.3		7.27		
PPM Cadmium	14.5	30.8		4.13		
PPM Chromium	2,131.0	1,035.7		239.7		
PPM Copper	5,695.0	1,641.8		642.0		
PPM Nickel	175.0	230.0		61.0		
PPM Vanadium	150.0	206.0		48.3		
% Total Carbon						
% Hydrogen						
% Nitrogen						
PPB DDT		170				
PPB PCB		1,050				

BRIDGEPORT HARBOR Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
Pequonnock River											
PE-5-73	OH	N	83.0	76	46	30	2.28	78.8	27.3	29.6	
GE-6	S	N	30.6	45	39	6	2.62			63.3	
GE-7	S	N	35.7	75	36	39	2.39			61.5	
GE-8	S	B	3.4				2.71			77.3	
MEAN-PEQUONOCK			38.2	65.3	40.3	25	2.50	78.8	27.3	57.9	
Yellow Mill Channel											
PE-1-73	OH	N	98.2	132	63	69	2.37	87.2	26.9	30.6	
PE-2	OH	N	94.0	115	51	64	2.66	98.2	32.4	30.0	
MEAN-1973			96.1	123.5	57	66.5	2.52	92.7	29.7	30.3	

JOHNSONS RIVER
BRIDGEPORT HARBOR

Johnsons River, at Bridgeport CT, is utilized by both commercial and recreational interests. The project is located at the eastern end of Bridgeport Harbor and extends about one mile up the river to the bridge at Interstate 95. The federal project consists of a 15-foot channel, 250 feet wide, extending from the 35 foot turning basin in the main harbor about ½ mile upstream to a 9-foot channel, 100-feet wide, which extends about 1300 feet upstream to a 6-foot anchorage at the bridge. A 6-foot, and a 9-foot anchorage area adjoins the 15-foot channel on the west at the West Branch of the river.

Environmental sampling and testing was undertaken in 1973 and 1980. Sampling in 1973 consisted of two tube samples taken from the 15-foot channel. Sample PE-4, from the upstream end of the channel showed abnormally high values for lead, zinc, aresenic, cadmium, chromium and nickel, and moderately high values for volatile solids, chemical oxygen demand, kjeldahl nitrogen, copper and vanadium.

JOHNSONS RIVER

BRIDGEPORT HARBOR

Parameter	Organic Silts			Sands & Gravels		
	1973			1973		
% Volatile Solids - EPA	10.82			None		
% Volatile Solids - NED	8.75					
% Total Volatile Solids	18.95					
PPM Chem. Oxygen Demand	180,000					
PPM Total Kjeldahl Nitrate	5,355					
PPM Oil and Grease	8,905					
#of tests on parameters above #of tests on parameters below	(2)/ (4)					
PPM Mercury	0.863					
PPM Lead	456.0					
PPM Zinc	975.3					
PPM Arsenic	13.7					
PPM Cadmium	23.7					
PPM Chromium	534.0					
PPM Copper	736.5					
PPM Nickel	142.8					
PPM Vanadium	98.8					
% Total Carbon						
% Hydrogen						
% Nitrogen						
PPB DDT						
PPB PCB						

BRIDGEPORT HARBOR Sample JOHNSONS RIVER	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
PE-3-73	OH	N	64.4	72	36	36	2.59	46.7	---	44.7	
PE-4	OH	N	93.0	120	57	63	2.49	79.8	24.9	26.9	
MEAN-1973			78.7	96	46.5	49.5	2.54	63.3	24.9	35.8	

CLINTON HARBOR

ENVIRONMENTAL SAMPLING AND TESTING

CLINTON HARBOR

Clinton Harbor, CT, is a mainly recreational harbor located at the mouth of the Hammonasset River on central Long Island Sound. The Federal project consists of an eight foot channel extending north from Long Island Sound, through outer Clinton Harbor, around the end of Cedar Island spit and westward up-river to the main waterfront.

A proposed improvement to the existing project is being studied. It consists of an extension of the existing channel by up to 1.5 miles up-river, and a smaller channel extending approximately 600 feet to the marinas at the mouth of the Indian and Hammock Rivers.

Environmental sampling and testing was undertaken in 1971, 1975, 1978 and 1980. Sampling in 1971 consisted of six tube samples taken in the existing portion of the project. The two samples taken behind the barrier spit showed abnormally high values for zinc, and above average values for mercury and lead. The four samples taken outside the spit in the outer harbor exhibited no significantly high values for any parameters.

Sampling in 1975 consisted of three tube samples and one grab sample taken downstream from the waterfront area. None of the samples showed any significantly high values when tested.

Sampling in 1978 was confined to the proposed improvement portion of the project and consisted of five tube samples. One sample was taken from the Indian River portion, and the remainder were taken from the Hammonasset River portion of the proposed improvement. All samples underwent elutriate analysis only.

Sampling in 1980 consisted of two grab samples taken from shoal areas in the entrance channel through outer Clinton Harbor. The samples underwent analysis for physical parameters only.

CLINTON HARBOR

Environmental Sampling History

June 1971 - Bulk Sediment Analysis (6)	PE-1-6 Lab Series: 100-18-1-8 Tests Run: Unit Weights, Volatile Solids, COD, TKN, 2 levels each heavy metal (Hg, Pb, Zn), grain size analysis.
August 1975 - Bulk Sedient Analysis (4)	PE-1-3, GE-4 Lab Series: 100-205-2-5 Tests Run: Unit Weights, Limits, Volatile Solids, COD, TKN, 7 each - Hg, Pb, Zn, As, Cd, Cr, Cu, Ni, V, C-H-N's (1), PCB(1), DDT(1), grain size analysis.
December 1978 - Borings (2) Standard Elutriate	FD-2,4 PE(EW) - 1,2,3,6,7 Lab Series: 100-274-1,15 Tests Run: Standard Elutriate testing.
July 1980 - Bulk Physical Analysis (2)	GE-1, 2 Lab Series: 100-314-1,2 Tests Run: Grain Size Analysis

CLINTON HARBOR

Parameter	Organic Silts			Sands & Gravels		
	1971	1975		1971	1975	
% Volatile Solids - EPA	7.7	6.27		1.60	0.828	
% Volatile Solids - NED	5.8	6.01		1.00	2.534	
% Total Volatile Solids	13.34	10.3		2.265	2.031	
PPM Chem. Oxygen Demand	122,600	92,000		9650	7220	
PPM Total Kjeldahl Nitrogen	3150	2540		525	313	
PPM Oil and Grease	4825	1000		513	247	
# of tests on parameters above / # of tests on parameters below	(2)/(3)	(1)/(2)		(4)/(9)	(3)/(5)	
PPM Mercury	1.933	0.44		0.289	0.036	
PPM Lead	403.3	55.5		31.2	17.0	
PPM Zinc	2037	208.5		147.8	31.4	
PPM Arsenic		7.7			0.18	
PPM Cadmium		2.7			1.20	
PPM Chromium		81.5			8.10	
PPM Copper		151.5			22.0	
PPM Nickel		46.5			9.70	
PPM Vanadium		69.5			20.4	
% Total Carbon		2.45				
% Hydrogen		0.50				
% Nitrogen		0.19				
PPB DDT					0.007	
PPB PCB					0.007	

CLINTON HARBOR

SUMMARY OF ELUTRIATE TEST RESULTS

* Number in ( ) is number of cases

TEST PARAMETER	DREDGE SITE WATER 1978 (5)*		SEDIMENT ELUTRIATE 1978 (10)	
Nitrite Nitrogen (PPM)	0.010		0.020	
Nitrate Nitrogen (PPM)	0.226		0.163 (9)	
Sulfate (SO_4) (PPM)	1330		1295	
Oil & Grease (PPM)	1.00		1.00	
Phosphorus - Ortho (PPM)	0.034		0.173	
Phosphorus - Total (PPM)	0.034		0.214	
HEAVY METALS				
Mercury ** (PPB)	0.22		0.25	
Lead	0.004		0.004	
Zinc	0.030		0.0126	
Arsenic	0.004		0.009	
Barium				
Berylium				
Cadmium	0.002		0.003	
Chromium	0.005		0.005	
Copper	0.003		0.002	
Nickel	0.005		0.005	
Selenium				
Silver				
Vanadium	0.0104		0.020	
ORGANOHALOGENS				
Total PCB, (ppt)	900 (1)		400 (1)	
Total DDT, (ppt)	500 (1)		200 (1)	

** All heavy metal values are in parts per million except Mercury.

CLINTON HARBOR Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
PE-1-71			94				2.60	78.9	31.8	40.6	
PE-2			88				2.60	80.2	32.9	40.8	
PE-3			22				2.62	97.2	61.3	61.8	
PE-4			4.0				2.67	115.3	88.2	75.6	
PE-5			3.0				2.69	119.9	88.7	73.6	
PE-6			5.0				2.66			68.8	
PE-6 Lower			2.0				2.70			76.7	
Mean 1971			31.1				2.65	98.3	60.6	62.56	
PE-1-75	S	N	8.5				2.68	123.6	97.7	78.22	
PE-2	S	N	7.0				2.67	122.6	95.8	77.85	
PE-3	M	N	97.0	97	43	54	2.59	88.0	39.8	43.47	
PE-3 Lower	S	N	42.5								
GE-4	S	N	3.6				2.65			82.86	
Mean 1975			31.7	97	43	54	2.65	111.4	77.8	70.6	
GE-1-80	S	N	0.0				2.66				
GE-2-80	S	N	0.0				2.64				
Mean -1980			0.0				2.65				
Project Mean			26.9	97	43	54	2.65	103.2	67.1	65.48	

CONNECTICUT RIVER

ENVIRONMENTAL SAMPLING AND TESTING

CONNECTICUT RIVER

BROCKWAY BAR

The Federal project at Brockway Bar is located about 9.5-10 miles upstream from the mouth of the Connecticut River. The project consists of a fifteen foot channel, 150 feet wide along the northen slope of the bar, south of Brockway Reach Light and Brockway Landing.

Environmental sampling and testing were undertaken in 1974. Sampling consisted of one grab sample taken opposite the mouth of Joshua Creek. The sample was analyzed for physical parameters only.

POTASH BAR

The Federal project at Potash Bar is located about 12-13 miles upstream of the mouth of the Connecticut River. The project consists of a fifteen foot channel, 150 feet wide, along the eastern slope of the bar at Selden Neck and north of Selden Creek.

Environmental sampling and testing was undertaken in 1974. Sampling consisted of one grab sample taken from the channel north of the mouth of Selden Creek. The sample was analyzed for physical parameters only.

CONNECTICUT RIVER Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
BROCKWAY BAR											
GE-9-74	S	N	0.5								
POTASH BAR											
GE-10-74	S	N	0.7								

CONNECTICUT RIVER

HAMBURG COVE

Hamburg Cove, CT is a small recreational harbor on the eastern shore of the lower Connecticut River at Lyme. Environmental sampling and testing was undertaken in July 1977. Sampling consisted of five grab samples taken over the length of the project channel. One sample taken at approximately the mid-point of the project showed abnormally high values (values in excess of two standard deviations above the mean of all North Atlantic Tidal System samples) for the parameters Volatile Solids and Mercury. The same sample also showed above average values (values in excess of one standard deviation) for the parameters chemical oxygen demand and kjeldahl nitrogen. All other samples showed no significantly high values for any parameters tested.

CONNECTICUT RIVER

HAMBURG COVE

Environmental Sampling History

July 1977 - Bulk Sediment Analysis (5)

GE-1-4

Lab Series: 100-254-1-5

Tests Run: Unit Weights, Limits, Volatile Solids, COD, TKN, 4 each -Hg, Pb, Zn, As, Cd, Cr, Cu, Ni, V, C-H-N's (2), PCB(1), DDT(1), grain size analysis.

CONNECTICUT RIVER

HAMBURG COVE

Parameter	Organic Silts			Sands & Gravels		
	1977			1977		
% Volatile Solids - EPA	15.595			3.735		
% Volatile Solids - NED	14.095			3.195		
% Total Volatile Solids	21.8			5.845		
PPM Chem. Oxygen Demand	210,000			46,300		
PPM Total Kjeldahl Nitrogen	4830			525		
PPM Oil and Grease	2285			753		
# of tests on parameters above # of tests on parameters below	(2)			(2)		
PPM Mercury	2.625			0.115		
PPM Lead	77.3			32.0		
PPM Zinc	237.8			97.85		
PPM Arsenic	3.45			1.05		
PPM Cadmium	5.7			1.65		
PPM Chromium	69.1			23.4		
PPM Copper	83.4			26.2		
PPM Nickel	71.1			32.0		
PPM Vanadium	51.9			12.8		
% Total Carbon	4.045					
% Hydrogen	1.35					
% Nitrogen	0.36					
PPB DDT				1.4		
PPB PCB				167.2		

CONNECTICUT RIVER Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
HAMBURG COVE											
GE-1-77	S	N	13.6				2.70			71.38	
GE-2	M	N	78.4	90	65	25	2.43			32.82	
GE-3	M	N	63.8	116	80	36	2.37			24.58	
GE-4	S	N	29.1				2.60			55.65	
GE-5	S	N	37.1				2.69				
Mean 1977			44.4	103	72.5	30.5	2.558			46.11	

CONNECTICUT RIVER

ESSEX SHOAL

Essex Shoal, CT is a mainly recreational project in the Connecticut River at Essex. Environmental sampling and testing was undertaken in 1974. Sampling consisted of six tube samples and two grab samples. Three tube samples were analyzed for physical properties only. Of the remaining samples only one, taken in the main river channel showed any abnormally high values (values in excess of two standard deviations above the mean of all North Atlantic Tidal System samples). The only unusually high parameter found in that sample was Vanadium. All other samples showed no significantly high values for any parameters tested.

CALVES ISLAND BAR

The main Connecticut River shipping channel through Calves Island Bar underwent environmental sampling and testing in 1974 and again in 1977. Sampling in 1974 consisted of two tube samples which were analyzed for physical parameters only. Sampling in 1977 consisted of three grab samples which were analyzed for chemical parameters as well as physical. None of the samples showed significantly high values for any parameters tested.

CONNECTICUT RIVER

ESSEX SHOAL AND CALVES ISLAND BAR

Environmental Sampling History

February 1974 - Bulk Sediment Analysis	PE-1,2 - Calves Island PE-3,4,5 - Essex Shoal, Lab Series: 100-130-1-5 Tests Run: grain size analysis.
September 1974 - Bulk Sediment Analysis (Essex Shoal Only)	GE-1,2, PE-3,4,5 Lab Series: 100-158-1-9 Tests Run: Unit Weights, Limits, COD, Volatile Solids, TKN, (Hg, Pb, Zn, As, Cd, Cr, Cu, Ni, V - 8 each) C-H-N's (3) PCB(1), DDT(1).
March 1977 - Bulk Sediment Analysis	GE-1, 2, 3 Lab Series: 100-237-1-3 Tests Run: GE-1, 2 - COD, Volatile solids, TKN, Hg, Pb, Zn, As, Cd, Cr, Cu, Ni, V, grain size analysis.
Standard Elutriate (Calves Island Bar Only)	Standard Elutriate Testing, using GE-3 - EW-1, grain size analysis.

CONNECTICUT RIVER

CALVES ISLAND BAR

Parameter	Organic Silts			Sands & Gravels		
	1977			1977		
% Volatile Solids - EPA	none			0.605		
% Volatile Solids - NED				0.260		
% Total Volatile Solids				1.840		
PPM Chem. Oxygen Demand				5275		
PPM Total Kjeldahl Nitrogen				205		
PPM Oil and Grease				230		
# of tests on parameters above # of tests on parameters below				(2)		
PPM Mercury				0		
PPM Lead				6.3		
PPM Zinc				34.9		
PPM Arsenic				1.75		
PPM Cadmium				0.1		
PPM Chromium				12.7		
PPM Copper				8.65		
PPM Nickel				5.1		
PPM Vanadium				5.0		
% Total Carbon						
% Hydrogen						
% Nitrogen						
PPB DDT						
PPB PCB						

CONNECTICUT RIVER

ESSEX SHOAL

Parameter	Organic Silts			Sands & Gravels		
	1974			1974		
% Volatile Solids - EPA	3.988			2.551		
% Volatile Solids - NED	3.715			2.303		
% Total Volatile Solids	8.385			3.907		
PPM Chem. Oxygen Demand	72,600			25,893		
PPM Total Kjeldahl Nitrogen	1900			903		
PPM Oil and Grease	2155			897		
# of tests on parameters above / # of tests on parameters below	(2)/(4)			(3)/(4)		
PPM Mercury	0.72			0.298		
PPM Lead	81.5			29.0		
PPM Zinc	254.3			87.3		
PPM Arsenic	3.95			1.25		
PPM Cadmium	6.98			1.93		
PPM Chromium	96.3			35.0		
PPM Copper	127.5			29.3		
PPM Nickel	54.0			28.8		
PPM Vanadium	33.5			223.8		
% Total Carbon	2.015			2.380		
% Hydrogen	0.530			0.56		
% Nitrogen	0.505			0.77		
PPB DDT	0.007					
PPB PCB	90.0					

CONNECTICUT RIVER Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
Calves Island Bar											
PE-1-74	SP	N	0.5								
PE-2	SP	N	0.5								
GE-1-77	S	B	0.2				2.71			78.18	
GE-2	S	B	0.4				2.68			78.96	
GE-3											
Mean 1977			0.35				2.695			78.57	
Essex Shoal											
PE-3-74(2)	ML										
PE-4	SP	N	1.0								
PE-5	SP	N	0.0								
GE-1-74(9)	S	N	0.8				2.71			80.3	
GE-2	S	N	0.5				2.68			78.8	
PE-3	M	N	79.4	57	41	16	2.64	88.7	39.0	42.3	
PE-4	M	N	91.0	86	53	33	2.60	81.2	33.3	47.8	
PE-5	S	N	37.2	34	28	6	2.70	136.9	82.5	64.6	
Mean 1974(9)			41.8	59	40.7	18.3	2.67	102.3	51.6	62.8	

CONNECTICUT RIVER

SAYBROOK - NORTH COVE

The North Cove project at Saybrook, CT consists of an anchorage within the cove, which is situated on the western shore of the Connecticut River. The anchorage is joined to the main Connecticut River shipping channel by a small entrance channel. Environmental sampling and testing was undertaken in 1974. Sampling consisted of six tube samples. Three samples taken in February were analyzed for physical parameters only. Samples taken in December were analyzed for chemical parameters as well as physical. None of the samples tested showed any significantly high values for any of the parameters tested.

The entrance channel to the cove was sampled in 1980. One grab sample was taken from a sandy shoal on the northern edge of the Connecticut River end of the channel. The sample contained primarily coarse material and underwent bulk physical testing only.

CONNECTICUT RIVER

SAYBROOK NORTH COVE

Environmental Sampling History

February 1974 - Bulk Sediment Analysis (3)	PE-6,7,8 Lab Series: 100-130-6,7,8 Tests Run: grain size analysis.
December 1974 - Bulk Sediment Analysis (3)	PE-1,2,3 Lab Series: 100-176-2-8, Tests Run: Unit Weights, Limits, Volatile Solids, COD TKN, 2 levels each (Hg, Pb, Zn, As, Cd, Cr, Cu, Ni, V) C-H-N's (3) PCB (1), DDT(1), grain size analysis.
Standard Elutriate Testing	Standard Elutriate Tests with EW-1 (100-177).
February 1980 - Bulk Sediment Analysis (1)	PE-1 Lab Series: 100-310-1 Tests Run: Grain size analysis

CONNECTICUT RIVER

SAYBROOK NORTH COVE

Parameter	Organic Silts			Sands & Gravels		
	1974			1974		
% Volatile Solids - EPA	8.820			4.10		
% Volatile Solids - NED	6.751			2.60		
% Total Volatile Solids	12.500			6.66		
PPM Chem. Oxygen Demand	114,500			54,500		
PPM Total Kjeldahl Nitrogen	3140			1190		
PPM Oil and Grease	3430			2540		
# of tests on parameters above / # of tests on parameters below	(2)/(5)			(1)		
PPM Mercury	0.454			0.18		
PPM Lead	90.0			75		
PPM Zinc	245.2			129		
PPM Arsenic	6.08			3.5		
PPM Cadmium	6.88			4.2		
PPM Chromium	91.0			46		
PPM Copper	111.6			58.0		
PPM Nickel	58.4			42.0		
PPM Vanadium	51.8			42.0		
% Total Carbon	3.525			1.56		
% Hydrogen	0.690			0.33		
% Nitrogen	0.275			0.09		
PPB DDT	0.007					
PPB PCB	80.0					

CONNECTICUT RIVER
SAYBROOK-NORTH COVE

SUMMARY OF ELUTRIATE TEST RESULTS

* Number in ( ) is number of cases

WATER

TEST PARAMETER	CORNFIELD SHOALS DUMP		SEDIMENT ELUTRIATE	
	1975 (1) *		1975 (6)	
Nitrite Nitrogen (PPM)	0.010		0.011	
Nitrate Nitrogen (PPM)	0.140		0.100	
Sulfate (SO_4) (PPM)	1400		1150	
Oil & Grease (PPM)	1.70		3.70	
Phosphorus - Ortho (PPM)	0.045		0.012	
Phosphorus - Total (PPM)	0.050		0.103	
HEAVY METALS				
Mercury ** (PPB)	0.30		0.06	
Lead	0.004		0.004	
Zinc	0.026		0.015	
Arsenic	0.003		0.010	
Barium				
Berylium				
Cadmium	0.004		0.002	
Chromium	0.005		0.005	
Copper	0.013		0.0113	
Nickel	0.014		0.017	
Selenium				
Silver				
Vanadium	0.008		0.008	
ORGANOHALOGENS				
Total PCB, (ppt)				
Total DDT, (ppt)				

** All heavy metal values are in parts per million except Mercury.

CONNECTICUT RIVER Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
SAYBROOK-NORTH COVE											
PE-6-74	ML										
PE-7	OL										
PE-8	OL										
Mean-Feb-74											
PE-1-74	M	N	98.2	84	46	38	2.61	88.6	36.5	39.1	
PE-2	S	N	47.9	39	28	11	2.70	92.5	53.3	47.9	
PE-2 lower	M	N	67.1	42	31	11	2.66			52.3	
PE-3	M	N	97.9	83	45	38	2.60	85.2	33.2	33.9	
Mean-Dec-74			77.8	62	37.5	24.5	2.64	88.8	41.0	43.3	
GE-1-80	S	N	1.0				2.73				
PROJECT MEAN			62.4	62	37.5	24.5	2.66	88.8	41.0	43.3	

CONNECTICUT RIVER

SAYBROOK SHOALS

The main Connecticut River channel at Saybrook Shoals is utilized by both recreational boats and commercial vessels. Environmental sampling and testing was undertaken in 1973 and again in 1977. Sampling consisted of three tube samples taken in 1973 and three grab samples taken in 1977. None of the samples tested showed any significantly high values for any of the parameters tested.

SAYBROOK OUTER BAR

The channel through Saybrook Outer Bay is the entrance to the Connecticut River shipping channel. Environmental sampling and testing was undertaken in 1973 and 1977. Sampling in 1973 consisted of three tube samples. Sampling in 1977 consisted of three grab samples. None of the samples tested showed any significantly high values for any of the parameters tested.

CONNECTICUT RIVER

SAYBROOK SHOALS & SAYBROOK OUTER BAR

Environmental Sampling History

July 1973 - Bulk Sediment Analysis (7)	PE-1,2,3, GE-1 (Outer Bar), PE-4-5,6, (Shoals) Lab Series: 100-118-1-7 Tests Run: Unit Weights, Limits, Volatile Solids, COD, TKN, 13 each - Hg, Pb, Zn, Cd, Cr, Cu, Ni; 12 each - As, V, C-H-N's (1), PCB (1), DDT(1), grain size analysis.
March 1977 - Bulk Sediment Analysis (6)	GE-4,5,6 (Shoals) GE-7,8,9 (Outer Bar) Lab Series: 100-237-4-12 Tests Run: Limits, Volatile Solids, COD, TKN, 6 each - Hg, Pb, Zn, As, Cd, Cr, Cu, Ni, V, grain size analysis.
Standard Elutriate	Standard Elutriate tests done with GE 4, 8 and EW 4, 8.

CONNECTICUT RIVER

SAYBROOK SHOALS

Parameter	Organic Silts			Sands & Gravels		
	1973	1977		1973	1977	
% Volatile Solids - EPA	2.5	5.40		1.175	none	
% Volatile Solids - NED	1.97	3.96		0.83		
% Total Volatile Solids	4.88	7.41		2.18		
PPM Chem. Oxygen Demand	36,300	62,150		8760		
PPM Total Kjeldahl Nitrogen	800	1510		200		
PPM Oil and Grease	1470	2345		360		
# of tests on parameters above / # of tests on parameters below	(1)	(2)/(2)		(2)/(5)		
PPM Mercury	0.6	0.695		0.184		
PPM Lead	30	66.5		40.0		
PPM Zinc	119	187.8		78.0		
PPM Arsenic	1.8	5.95		1.702		
PPM Cadmium	3.0	1.7		4.02		
PPM Chromium	42	58.7		34.0		
PPM Copper	57	69.1		40.8		
PPM Nickel	35	33.6		23.6		
PPM Vanadium	31	50.7		30.4		
% Total Carbon						
% Hydrogen						
% Nitrogen						
PPB DDT						
PPB PCB						

CONNECTICUT RIVER

SAYBROOK SHOALS

SUMMARY OF ELUTRIATE TEST RESULTS

* Number in ( ) is number of cases

TEST PARAMETER	DREDGE SITE WATER		SEDIMENT ELUTRIATE	
	1977 (2)*		1977 (2)	
Nitrite Nitrogen (PPM)	0.010		0.027	
Nitrate Nitrogen (PPM)	0.350		0.100	
Sulfate (SO_4) (PPM)	73		189	
Oil & Grease (PPM)	2.00		4.15	
Phosphorus - Ortho (PPM)	0.029		0.025	
Phosphorus - Total (PPM)	0.042		0.197	
HEAVY METALS				
Mercury ** (PPB)	0.13		0.22	
Lead	0.002		0.0075	
Zinc	0.014		0.0125	
Arsenic	0.0015		0.000	
Barium				
Berylium				
Cadmium	0.0005		0.0015	
Chromium	0.003		0.003	
Copper	0.024		0.014	
Nickel	0.006		0.008	
Selenium				
Silver				
Vanadium	0.010		0.010	
ORGANOHALOGENS				
Total PCB, (ppt)				
Total DDT, (ppt)				

** All heavy metal values are in parts per million except Mercury.

CONNECTICUT RIVER Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
Saybrook Shoals											
PE-4-73	S	N	2.7				2.70	86.3	75.0	77.1	
PE-4 Lower	OH	B	63.3	66	33	33	2.63			82.3	
PE-5	S	N	3.6				2.68	87.7	78.4	77.3	
PE-5 Lower	S	B	21.1				2.67			76.3	
PE-6	S						2.69	136.5	109.1	73.6	
PE-6 Lower	S	N	1.6				2.69			82.2	
Mean 1973			18.5	66	33	33	2.68	103.5	87.5	78.1	
GE-4-77											
GE-5	M	B	51.3	54	34	20	2.66			54.97	
GE-6	M	B	69.5	65	37	28	2.70			47.83	
Mean 1977			60.5	59.5	35.5	24	2.68			51.40	
Project Mean			30.5	61.7	34.7	27.0	2.68	103.5	87.5	71.43	

CONNECTICUT RIVER

SAYBROOK-OUTER BAR

Parameter	Organic Silts			Sands & Gravels		
	1973	1977		1973	1977	
% Volatile Solids - EPA	6.438	8.71		none	none	
% Volatile Solids - NED	5.08	7.63				
% Total Volatile Solids	6.81	11.2				
PPM Chem. Oxygen Demand	76,425	107,150				
PPM Total Kjeldahl Nitrogen	2015	3105				
PPM Oil and Grease	1708	1995				
# of tests on parameters above / # of tests on parameters below	(4)/(7)	(2)/(2)				
PPM Mercury	0.464	0.240				
PPM Lead	74.1	65.0				
PPM Zinc	188.7	210.4				
PPM Arsenic	3.55	10.4				
PPM Cadmium	1.88	1.95				
PPM Chromium	47.9	83.0				
PPM Copper	65.9	87.3				
PPM Nickel	45.9	35.0				
PPM Vanadium	36.5	65.3				
% Total Carbon						
% Hydrogen						
% Nitrogen						
PPB DDT						
PPB PCB						

CONNECTICUT RIVER Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
Saybrook Outer Bar											
PE-1-73	S	N	39.4				2.58	86.1	45.5	52.8	
PE-1-Middle	OH	N	67.6	61	40	21	2.53			43.8	
PE-1-Low-Mid	S		41.3				2.62				
PE-1-Lower	OH	N	64.5	51	38	13	2.58			60.46	
PE-2	OH	B	58.4	75	46	29	2.62	83.7	36.2	39.1	
GE-1	OH	N	78.3	62	42	21	2.61			43.4	
PE-3	OL	N	66.6	49	37	12	2.61	95.8	51.1	51.4	
Mean 1973			59.4	59.6	40.6	19.2	2.593	85.5	44.3	48.49	
GE-7-77	M	B	85.9	87	44	43	2.64			37.87	
GE-8-77											
GE-9-77	M	B	76.1	71	38	33	2.61			42.46	
Mean 1977			81.0	79	41	38	2.625			40.17	
Project Mean			64.2	65.1	40.7	24.6	2.60	85.5	44.3	46.41	
Connecticut River Mean			37.1	62.9	39.3	23.7	2.65	97.1	61.1	61.47	

FIVEMILE RIVER HARBOR

ENVIRONMENTAL SAMPLING AND TESTING

FIVEMILE RIVER HARBOR

Fivemile River, CT is a mainly recreational harbor on Western Long Island Sound. The harbor is located at the mouth of the Fivemile River, on the Norwalk-Darien town line, about seven miles east of Stamford Harbor. The federal project consists of an eight foot channel extending from Long Island Sound to about 0.9 miles upstream.

Environmental sampling and testing was undertaken in March of 1974. Sampling consisted of six tube samples taken over the full length of the project. One sample (PE-5) taken just south of the mouth of Tokeneke Creek showed an abnormally high value for vanadium. The uppermost sample (PE-1) exhibited above average values for volatile solids, chemical oxygen demand, kjeldahl nitrogen, vanadium, and percent total carbon. Samples PE-2 and 3 also showed above average values for kjeldahl nitrogen. The outermost sample (PE-6) exhibited an above average value for vanadium.

FIVE MILE RIVER

Environmental Sampling History

March 1974 - Bulk Sediment Analysis (6)

PE-1-6

Lab Series: 100-134-1-12

Tests Run: Unit Weights, Limits, COD, Volatile Solids, TKN, 2 levels each metal - (Hg, Pb, Zn, As, Cd, Cr, Cu, Ni, V) for a total of 12 heavy metal samples, C-H-N's (6), DDT(1), PCB(1), grain size analysis.

FIVE MILE RIVER

Parameter	Organic Silts			Sands & Gravels		
	1974			1974		
% Volatile Solids - EPA	8.944			none		
% Volatile Solids - NED	7.488					
% Total Volatile Solids	14.828					
PPM Chem. Oxygen Demand	137,883					
PPM Total Kjeldahl Nitrogen	4,268					
PPM Oil and Grease	6,988					
# of tests on parameters above / # of tests on parameters below	(6)/(12)					
PPM Mercury	0.677					
PPM Lead	29.6					
PPM Zinc	304.3					
PPM Arsenic	7.5					
PPM Cadmium	7.4					
PPM Chromium	167.2					
PPM Copper	200.3					
PPM Nickel	57.9					
PPM Vanadium	101.3					
% Total Carbon	4.050					
% Hydrogen	0.895					
% Nitrogen	0.420					
PPB DDT	.160					
PPB PCB	300					

FIVE MILE RIVER Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
PE-1-74	OH	N	95.8	107	55	52	2.49	88.34	30.28	26.33	
PE-2	MH	N	93.5	120	58	62	2.61	80.66	28.91	28.20	
PE-2 Lower	MH	N	95.9	117	53	63	2.66			34.78	
PE-3	MH	B	78.8	116	52	64	2.59	84.41	30.40	22.73	
PE-3 Lower	MH			117	53	63	2.66			42.74	
PE-4	MH							99.70	48.57	52.31	
PE-4 Lower	MH	N	78.0	93	46	47	2.65			42.03	
PE-5	MH	B	58.2	79	39	40	2.62	86.09	35.21	32.02	
PE-6	MH	B	57.3	68	34	34	2.66	87.34	36.96	37.35	
Mean - 1974			79.6	102.1	48.8	53.1	2.62	87.76	35.06	35.39	

GREENWICH HARBOR

ENVIRONMENTAL SAMPLING AND TESTING

GREENWICH HARBOR

Greenwich Harbor, CT is a mainly recreational port, with some commercial fishing operations, on Western Long Island Sound. Environmental sampling and testing was undertaken in March of 1974. Abnormally high values for concentrations of the metals Mercury and Lead (values in excess of two standard deviations from the mean of all North Atlantic Tidal System samples) were found in one sample taken from the uppermost end of the project channel. Above average values (exceeding only one standard deviation) for the parameters volatile solids, chemical oxygen demand and percent carbon were also found at the same location. Similar above average values for kjeldahl nitrogen and Vanadium were found in the central portion of the project.

GREENWICH HARBOR

Environmental Sampling History

1974 - Bulk Sediment Analysis (6)	PE-1, 3-6, GE-2 Lab Series: 100-135-2-11 Tests Run: Unit Weights, Limits, COD, Volatile Solids, TKN, 1 each - Hg, Pb, Zn, As, Cd, Cr, Cu, Ni, V, C-H-N's (6) DDT(1), PCB(1), grain size analysis.

Parameter	Organic Silts			Sands & Gravels		
	1974			1974		
% Volatile Solids - EPA	8.63			3.04		
% Volatile Solids - NED	8.93			2.13		
% Total Volatile Solids	17.13			5.18		
PPM Chem. Oxygen Demand	161,500			39,300		
PPM Total Kjeldahl Nitrogen	4813			1155		
PPM Oil and Grease	8183			1670		
# of tests on parameters above / # of tests on parameters below	(4)/(8)			(2)/(3)		
PPM Mercury	1.464			0.413		
PPM Lead	298.6			46.7		
PPM Zinc	366.3			152.3		
PPM Arsenic	4.8			3.0		
PPM Cadmium	6.8			3.3		
PPM Chromium	96.5			41.0		
PPM Copper	214.9			88.0		
PPM Nickel	66.4			33.0		
PPM Vanadium	85.4			48.3		
% Total Carbon	5.088			1.485		
% Hydrogen	1.100			0.345		
% Nitrogen	0.523			0.155		
PPB DDT	1020					
PPB PCB	1590					

GREENWICH HARBOR Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
PE-1-74	OH	N	78.6	96	51	46	2.58	88.84	37.27	37.89	
GE-2	S	N	22.0	74	35	39	2.66			70.38	
PE-3	S	N	28.2	66	37	29	2.68	96.20	46.76	55.88	
PE-4	S	B	63.6	116	60	56	2.66	89.21	37.83	41.11	
PE-5	MH	N	96.5	121	49	72	2.65	83.91	29.97	33.08	
PE-6	S	B	58.2	105	48	57	2.63	86.96	35.71	34.47	
Mean - 1974			57.9	96.3	46.7	49.8	2.64	89.02	37.51	45.47	

GUILFORD HARBOR

ENVIRONMENTAL SAMPLING AND TESTING

GUILFORD HARBOR

Guilford Harbor, CT, is a mainly recreational harbor located on Central Long Island Sound about seventeen miles east of New Haven. The Federal project consists of a six foot channel extending from the sound, through Guilford Harbor to an anchorage in East River which is sheltered by Grass Island. The project also included a smaller six foot channel extending from the entrance channel northward up Sluice Creek for about 800 feet.

Environmental sampling and testing was undertaken in 1972 and 1975. Sampling in 1972 consisted of eight tube samples taken throughout the project. One sample (PE-3) taken off Guilford Point in the outer section of the project showed an abnormally high value for concentration of oil and grease. All other samples exhibited no significantly high values for any parameters tested.

Sampling in 1975 consisted of five tube samples taken throughout the project. None of the samples showed any significantly high values for the parameters tested.

GUILFORD HARBOR

Environmental Sampling History

March 1972 - Bulk Sediment Analysis (8)

PE-1-8

Lab Series: 100-65-1-8

Tests Run: Unit Weights, Limits, Volatile Solids, COD, TKN, 2 levels each heavy metal (Hg, Pb, Zn, Cr, Cd, Cu) PCB(3), DDT(3) grain size analysis.

July 1975 - Bulk Sediment Analysis (5)

PE-1-5

Lab Series: 100-206-1-6

Tests Run: Unit Weights, Limits, Volatile Solids, COD, TKN, 2 levels each heavy metal, (Hg, Pb, Zn, As, Cd, Cr, Cu, Ni, V) C-H-N's (3), DDT(1), PCB(1), grain size analysis.

Parameter	Organic Silts			Sands & Gravels		
	1972	1975		1972	1975	
% Volatile Solids - EPA	6.838	7.217		0.54	1.38	
% Volatile Solids - NED	5.482	7.593		0.33	0.77	
% Total Volatile Solids	10.207	11.733		2.54	2.39	
PPM Chem. Oxygen Demand	90,786	106,767		12,500	10840	
PPM Total Kjeldahl Nitrogen	2,614	3,293		200	315	
PPM Oil and Grease	13,549	1,560		100	355	
# of tests on parameters above / # of tests on parameters below	(7)/(14)	(3)/(7)		(1)/(2)	(2)/(3)	
PPM Mercury	0.345	0.412		0.03	0.029	
PPM Lead	63.6	67.3		6.35	15.0	
PPM Zinc	202.9	187.6		14.85	40.7	
PPM Arsenic		8.06			2.57	
PPM Cadmium	1.950	2.67		0.3	1.17	
PPM Chromium	79.0	100.7		1.6	18.7	
PPM Copper	122.7	88.7		8.4	24.0	
PPM Nickel		60.9			18.3	
PPM Vanadium		55.7			22.3	
% Total Carbon						
% Hydrogen						
% Nitrogen						
PPB DDT					0.007	
PPB PCB					0.007	

GUILFORD HARBOR Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
PE-1-72			95	102	46	56	2.562	78.4	28.2	35.87	
PE-2			87				2.605	78.3	27.5	37.20	
PE-3			84				2.552	77.2	35.6	43.95	
PE-4			83	39	30	9	2.694	101.1	59.6	55.58	
PE-5			94	92	47	45	2.549	79.6	33.8	42.00	
PE-6			1.0				2.764	125.7	107.0	91.34	
PE-7			99	106	51	55	2.596	81.2	32.3	38.55	
PE-8			98	118	50	68	2.556	72.8	25.2	32.35	
Mean - 1972			80.1	91.4	44.8	46.6	2.610	86.8	43.7	47.11	
PE-1-75	S	N	6.6				2.67	106.1	66.6	77.48	
PE-1 Lower	M	N	59.9	70	39	31	2.62			52.95	
PE-2	M	N	87.9	93	41	52	2.64	87.9	36.3	38.07	
PE-3	M	N	95.0	100	45	55	2.65	84.3	33.2	36.79	
PE-4	M	N	95.7	88	40	48	2.61	88.7	39.6	40.66	
PE-5	S	N	31.2				2.72	121.1	90.2	38.00	
Mean - 1975			62.7	87.8	41.3	46.5	2.65	97.6	53.2	47.33	
Project Mean			72.6	89.8	43.2	46.6	2.627	91.0	47.4	47.22	

HOUSATONIC RIVER

ENVIRONMENTAL SAMPLING AND TESTING

HOUSATONIC RIVER

The Housatonic River, CT is a mainly recreational project on Western Long Island Sound. Environmental sampling and testing was undertaken in November of 1971. Sampling consisted of fourteen kullenberg core samples taken throughout the length of the project channel. Abnormally high values for concentrations of the metals Zinc and Copper (values in excess of two standard deviations above the mean of all North Atlantic Tidal System samples) were found in samples taken in the vicinity of the Interstate 95 bridge. All other samples and parameters were average (within one standard deviation.).

HOUSATONIC RIVER

Environmental Sampling History

October 1971 - Bulk Sediment Analysis (14) KE-1-14

Lab Series: 100-49-1-10,
100-50-1-15

Tests Run: Unit Weights,
COD, Volatile Solids, TKN, 2
levels each - Hg, Pb, Zn, Cu,
grain size analysis.

HOUSATONIC RIVER

Parameter	Organic Silts			Sands & Gravels		
	1971			1971		
% Volatile Solids - EPA	10.9			2.46		
% Volatile Solids - NED	8.53			1.98		
% Total Volatile Solids	19.39			4.90		
PPM Chem. Oxygen Demand	184,400			36,526		
PPM Total Kjeldahl Nitrogen	3600			607		
PPM Oil and Grease	2670			2274		
# of tests on parameters above # of tests on parameters below	(1)/(3)			(15)/(27)		
PPM Mercury	0.017			0.129		
PPM Lead	23.1			39.6		
PPM Zinc	86.1			230.4		
PPM Arsenic						
PPM Cadmium						
PPM Chromium						
PPM Copper	48.7			253.8		
PPM Nickel						
PPM Vanadium						
% Total Carbon						
% Hydrogen						
% Nitrogen						
PPB DDT						
PPB PCB						

HOUSATONIC RIVER Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
KE-1-71			3.0				2.726	108.2	83.3	73.88	
KE-1 T2			49				2.698	95.6	77.4	52.98	
KE-2			16				2.588	85.2	51.3	68.82	
KE-2 lower			89				2.556				
KE-3			82				2.484	73.2	28.5	38.58	
KE-4			2.0				2.708	119.4	102.7	76.80	
KE-5			1.0				2.718	105.9	85.2	79.79	
KE-6			1.0				2.684	122.6	99.8	76.90	
KE-7			2.0				2.662	97.8	75.2	76.57	
KE-8			2.0				2.707	108.9	78.9	74.10	
KE-9			6.0				2.663	130.2	96.4	67.05	
KE-9 T2			2.0				2.688	119.4	94.9	84.21	
KE-10			42				2.556	74.4	35.7	39.37	
KE-11			2.0				2.697	132.9	107.0	75.51	
KE-12			19				2.595	89.3	52.8	72.57	
KE-13			29				2.538	77.1	40.8	60.18	
KE-14			2.0				2.685	105.2	84.0	71.60	
Mean-1971			20.5				2.644	102.8	74.6	68.06	

LITTLE NARRAGANSETT BAY

ENVIRONMENTAL SAMPLING AND TESTING

LITTLE NARRAGANSETT BAY

Little Narragansett Bay, CT is a mainly recreational project on Eastern Long Island Sound. Environmental sampling and testing was undertaken in 1971, and again in 1975. Sampling in 1971 consisted of five grab samples and one tube sample distributed throughout the length of the project channel. A similar pattern of sampling was done in 1975 with grab samples taken in the lower end of the project and tube samples in the upper end. None of the samples taken in either year showed any significantly high values (values in excess of two standard deviations from the mean of all North Atlantic Tidal System samples) for any of the parameters tested.

LITTLE NARRAGANSETT BAY

Environmental Sampling History

October 1971-Bulk Sediment Analysis (7)	GE-1-6, PE-1 Lab Series: 100-42-8, 1-6 Tests Run: Unit Weights, COD, Volatile Solids, TKN, grain size analysis.
August 1975-Bulk Sediment Analysis (5)	GE-1,2 PE-3, 4, 7 Lab Series: 100-209-1-8 Tests Run: Unit Weights, Limits, COD, Volatile Solids, TKN, 11 each-Hg, Pb, Zn, As, Cd, Cr, Cu, Ni, V, C-H-N's(2), DDT(1), PCB (1), grain size analysis.

Parameter	Organic Silts			Sands & Gravels		
	1971	1975		1971	1975	
% Volatile Solids - EPA	9.65	8.67		1.905	0.948	
% Volatile Solids - NED	8.87	9.35		1.544	0.717	
% Total Volatile Solids	14.3	15.4		3.426	2.37	
PPM Chem. Oxygen Demand	132,450	143,500		21,520	10,697	
PPM Total Kjeldahl Nitrogen	4100	4205		780	263	
PPM Oil and Grease	2460	3020		530	330	
# of tests on parameters above / # of tests on parameters below	(2)/(2)	(2)/(4)		(7)/(8)	(3)/(4)	
PPM Mercury	0.37	0.525		0.087	0.208	
PPM Lead	59.1	60.3		22.9	10.5	
PPM Zinc	110.0	123.5		43.2	20.7	
PPM Arsenic		5.3			1.1	
PPM Cadmium		2.1			1.0	
PPM Chromium		85.0			10.6	
PPM Copper		102.5			23.0	
PPM Nickel		29.3			8.0	
PPM Vanadium		38.3			15.3	
% Total Carbon		4.625				
% Hydrogen		0.670				
% Nitrogen		0.385				
PPB DDT		0.007				
PPB PCB		200				

LITTLE NARRAGANSETT BAY Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
GE-1-71			1.0				2.647			77.93	
GE-2			2.0				2.664			65.18	
GE-3			64.0				2.592			51.02	
GE-4			43.0				2.617			64.82	
GE-5			7.0				2.675			72.13	
GE-6			2.0				2.659			79.54	
PE-1			49.0				2.412	82.6	29.3	25.03	
PE-1 lower							2.581			61.19	
Mean-1971			24.0				2.606	82.6	29.3	62.11	
GE-1-75	S	B	0.2				2.66			91.61	
GE-2	S	B	6.8				2.69			76.9	
PE-3	S	N	78.8	98	57	41	2.53	83.5	31.9	29.05	
PE-3 lower	M	B	59.7				2.61			57.49	
PE-4	S	N	21.4				2.63	109.8	78.1	74.70	
GE-5	S	B	5.3				2.64			80.74	
PE-6	S	B	1.9				2.69	135.4	111.4	80.74	
PE-7	M	B	89.7	95	49	46	2.58	80.4	33.2	38.42	
Mean-1975			40.0	96.5	53	43.5	2.63	102.3	63.7	66.21	
PROJECT MEAN			32.5	96.5	53	43.5	2.618	98.4	56.8	64.16	

MIANUS RIVER

ENVIRONMENTAL SAMPLING AND TESTING

MIANUS RIVER

Mianus River, CT is a port on Western Long Island Sound which is upstream of Coscob Harbor. It hosts a small number of commercial fishing vessels as well as recreational boats. Environmental sampling and testing was undertaken in March of 1975. Sampling consisted of five tube samples spaced over the length of the project channel. One sample taken below the railroad bridge showed abnormally high values (values in excess of two standard deviations above the mean of all North Atlantic Tidal Systems samples) for the parameters Arsenic and percent total carbon. The same sample also showed above average values (values in excess of one standard deviation) for volatile solids. All other samples showed no significantly high values for any parameters tested.

MIANUS RIVER

Environmental Sampling History

March 1975 - Bulk Sediment Analysis (5) PE-1-5

Lab Series: 100-185-1-13

Tests Run: Unit Weights, Limts, COD, Volatile Solids, TKN, 2 levels each heavy metal (Hg, Pb, Zn, As, Cd, Cr, Cu, Ni, V), C-H-N's (5) DDT(1), PCB(1), grain size analysis.

MIANUS RIVER

Parameter	Organic Silts			Sands & Gravels		
	1975			1975		
% Volatile Solids - EPA	10.06			9.86		
% Volatile Solids - NED	7.38			7.21		
% Total Volatile Solids	14.65			15.0		
PPM Chem. Oxygen Demand	135,825			140,000		
PPM Total Kjeldahl Nitrogen	2878			2960		
PPM Oil and Grease	2788			3150		
# of tests on parameters above / # of tests on parameters below	(4)/(8)			(1)/(2)		
PPM Mercury	0.904			0.465		
PPM Lead	141.1			231.5		
PPM Zinc	238.0			205.0		
PPM Arsenic	13.4			4.75		
PPM Cadmium	12.6			3.35		
PPM Chromium	87.5			66.0		
PPM Copper	153.6			152.0		
PPM Nickel	57.5			52.5		
PPM Vanadium	69.0			43.5		
% Total Carbon	5.763			2.80		
% Hydrogen	0.655			0.54		
% Nitrogen	0.185			0.07		
PPB DDT						
PPB PCB						

MIANUS RIVER

SUMMARY OF ELUTRIATE TEST RESULTS

* Number in ( ) is number of cases

WATER

TEST PARAMETER	EATONS NECK DUMP * 1975 (1)		SEDIMENT ELUTRIATE 1975 (10)	
Nitrite Nitrogen (PPM)	0.010		0.011	
Nitrate Nitrogen (PPM)	0.120		0.188	
Sulfate (SO_4) (PPM)	1350		1205	
Oil & Grease (PPM)	1.70		2.06	
Phosphorus - Ortho (PPM)	0.050		0.129	
Phosphorus - Total (PPM)	0.065		0.197	

HEAVY METALS

Mercury ** (PPB)	0.00		0.00	
Lead	0.005		0.007	
Zinc	0.015		0.005	
Arsenic	0.000		0.017	
Barium				
Berylium				
Cadmium	0.001		0.002	
Chromium	0.003		0.003	
Copper	0.009		0.006	
Nickel	0.003		0.0032	
Selenium				
Silver				
Vanadium	0.010		0.015	

ORGANOHALOGENS

Total PCB, (ppt)				
Total DDT, (ppt)				

** All heavy metal values are in parts per million except Mercury.

MIANUS RIVER Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
PE-1-75	M	N	71.0	74	48	26	2.43	88.8	37.0	45.30	
PE-2	M		85.7	82	41	41	2.61	102.0	52.4	49.32	
PE-3	M	N	96.3	111	48	63	2.57	84.2	31.4	35.93	
PE-4	M	N	99.1	114	52	62	2.59	81.9	29.6	31.58	
PE-5	S	N	35.7	79	39	40	2.62	112.3	59.5	49.40	
Mean-1975			77.6	92	45.6	46.4	2.56	93.8	42.0	42.31	

MILFORD HARBOR

ENVIRONMENTAL SAMPLING AND TESTING

MILFORD HARBOR

Milford Harbor, CT is a mainly recreational project located on Central Long Island Sound just east of the Housatonic River. The Federal project consists of a 10 foot entrance channel from the Sound between Burns Point and Gulf Beach to an anchorage at the State Pier, and an eight foot channel extending up the Wepawaug River to the Milford town wharf with an adjoining anchorage on the west.

Environmental sampling and testing were undertaken in 1972, 1975, and 1980. Sampling in 1972 consisted of two tube samples taken in the upper-eight foot section of the project and four grab samples taken in the outer ten foot section. Moderately high values for arsenic were found in the three northern most (upstream) samples. The three downstream grabs showed no significantly high values for any of the parameters tested.

Sampling in 1975 consisted of five tube samples and one grab sample which was taken between the jetties. The two northernmost tube samples exhibited abnormally high values for volatile solids and moderately high values for nickel. Of these two samples the one taken in the anchorage (PE-2) also showed abnormally high values for chemical oxygen demand, kjeldahl nitrogen, mercury, cadmium, percent total carbon, and a moderately high value for percent nitrogen. Sample PE-3, from the lower end of the eight foot channel exhibited a moderately high value for vanadium. The three downstream samples showed no significantly high values.

Sampling in 1980 consisted of six grab samples. Four of these were taken from the entrance channel, outside of the jetties. The remaining two samples were taken off of Gulf Beach. These samples were found to be predominantly sands and gravels and underwent physical testing only.

MILFORD HARBOR

Environmental Sampling History

July 1972 - Bulk Sediment Analysis (6)

PE-1-2, GE-3-5

Lab Series: 100-75-1-8

Tests Run: Unit Weights, Limits, Volatile Solids, TKN COD, 8 each - Hg, Pb, Zn, As, Cd, Cr, Cu, Ni, V, grain size analysis.

July 1975 - Bulk Sediment Analysis (6)

PE-1-4,6, GE-5

Lab Series: 100-208-1-7

Tests Run: Unit Weights, Limits, Volatile Solids, TKN, COD, 11 each -Hg, Pb, Zn, As, Cd, Cr, Cu, Ni, V, C-H-N's (4), DDT(1), PCB(1), grain size analysis.

March 1980 - Bulk Physical Analysis (6)

GE-1,2 - Beach Samples

GE-3,4,5,6 - Entrance Channel

Lab Series: 100-312-1-6

Tests Run: Grain size analysis.

MILFORD HARBOR

Parameter	Organic Silts			Sands & Gravels		
	1972	1975		1972	1975	
% Volatile Solids - EPA	9.84	10.98		1.70	1.123	
% Volatile Solids - NED	7.68	10.71		1.31	0.51	
% Total Volatile Solids	15.70	21.28		3.07	1.90	
PPM Chem. Oxygen Demand	146,700	203,750		17,867	5910	
PPM Total Kjeldahl Nitrogen	3600	5190		647	110	
PPM Oil and Grease	3385	9362		2173	260	
# of tests on parameters above / # of tests on parameters below	(3)/(5)	(4)/(8)		(3)/(3)	(2)/(3)	
PPM Mercury	0.308	1.717		0.063	0.077	
PPM Lead	174.8	211.0		25.3	15.57	
PPM Zinc	362.3	397.4		58.9	47.7	
PPM Arsenic	16.9	7.09		8.4	1.33	
PPM Cadmium	4.64	15.29		1.13	1.33	
PPM Chromium	158.5	194.4		28.9	23.0	
PPM Copper	298.1	417.5		60.4	42.0	
PPM Nickel	59.4	83.5		18.9	15.0	
PPM Vanadium	55.9	67.4		13.3	17.3	
% Total Carbon		4.725				
% Hydrogen		0.835				
% Nitrogen		0.525				
PPB DDT		0.007				
PPB PCB		0.007				

MILFORD HARBOR Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
PE-1-72	OH	N	97	107	53	54	2.517	76.8	25.2	33.37	
PE-2	OH	N	93	109	53	56	2.563	77.4	27.2	28.95	
GE-3	S	N	13				2.652			67.48	
GE-4	S	N	2				2.684			77.09	
GE-5	S	N	14				2.698			67.77	
GE-6	OH	N	73	102	46	56	2.519			35.86	
Mean-1972			48.7	106	50.7	55.3	2.606	77.1	26.2	51.75	
PE-1-75	M	N	88.1	113	55	58	2.52	79.5	24.8	31.65	
PE-2	M	N	90.2	159	62	97	2.41	73.2	20.1	28.79	
PE-3	M	N	97.2	132	54	78	2.56	77.4	25.6	32.12	
PE-4	M	N	53.5	59	31	28	2.65	95.3	46.3	41.35	
GE-5	S	B	4.4				2.68			78.38	
PE-6	S	B	4.8				2.71	128.0	101.0	76.41	
Mean-1975			56.4	115.8	50.5	65.3	2.59	90.7	43.6	48.12	
GE-1-80	SP	N	0.0				2.72				
GE-2	SW	N	0.0				2.78				
GE - 3	S	N	0.5				2.66				
GE- 4	S	N	1.8				2.69				

MILFORD HARBOR Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
GE-5-80	S	N	1.5				2.70				
GE-6	SP	N	16.5				2.74				
Mean - 1980			3.4				2.715				
PROJECT MEAN			36.2	111.6	50.8	61.0	2.637	86.8	38.6	49.94	

NEW HAVEN HARBOR

ENVIRONMENTAL SAMPLING AND TESTING

NEW HAVEN HARBOR

New Haven Harbor is the principle commercial port of Connecticut, situated on Central Long Island Sound. Environmental sampling and testing was undertaken in 1970, 1971, 1973, 1974, 1977 and 1978. Sampling in 1970 consisted of 95 tube samples, four of which were tested for chemical parameters. None of the samples showed any unusual values. Sampling in 1971 consisted of 33 tube samples. Four of the samples taken inside of the breakwater showed above average values (values in excess of one standard deviation above the mean of all North Atlantic Tidal System samples) for volatile solids, chemical oxygen demand, total kjeldahl nitrogen, Lead and Zinc. Sampling in 1973 consisted of six samples which were tested for percent carbon-hydrogen-nitrogen only. None of the samples showed any unusual values. Samples taken in 1974 consisted of six physical borings only. Samples taken in 1977 consisted of five elutriate samples, four samples which were tested for chemical parameters. One of the samples showed above average values for volatile solids, kjeldahl nitrogen. Samples taken in 1978 consisted of 37 samples which were tested for physical parameters only, and three grab samples which were tested for physical and chemical parameters and also for Bioassay. None of the samples tested showed any significantly high values for any parameters.

NEW HAVEN HARBOR

Environmental Sampling History

October 1970 - Bulk Sediment Analysis (95) K-1-95

Lab Series: 27-839-1-4

Tests Run: (4 samples) Volatile Solids, Pb, Zn, Cd, Cr, Cu, Ni, Ag, Sn, C-H-N's (4), (95 samples) grain size analysis.

October 1971 - Bulk Sediment Analysis (33) KE-1-23 (inner harbor)

KE-24-33 (outer harbor)

Lab Series: 100-48-1-17, 100-45-1-10, 100-47-1-30

Tests: COD, Unit Weights, Volatile Solids, Pb, Zn, Hg, for 2 levels each sample, Cu, (29 inner harbor).

April 1972 - Bulk Sediment Analysis (8) West River

PE-1-7 (Tubes) GE-8 (Grab)

Lab Series: 100-70-1-15

Tests Run: COD, Volatile Solids, Unit Weights, 2 levels each -Zn, Pb, Hg, Cd, Cr, Cu, PCB(1), DDT(1).

NEW HAVEN HARBOR (Continued)

ENVIRONMENTAL SAMPLING

September 1973- Bulk Sediment Analysis (6)	PE-1-6 Lab Series: 100-123-1-6 Tests Run: C-H-N'(12).
Standard Elutriate Testing	Elutriate Testing using dumped ground water (EW-1).
May 1977 - Bulk Sediment Analysis (5)	FD-5-9 (Tubes) Lab Series: 100-244-1,2, 100-246-1,2,3 Tests: Unit Weights, COD, Volatile Solids, Pb, Zn, Hg, Cd, Cr, Ni, V. (5 sample each parameter).
September 1977 - Standard Elutriate (5)	Ge-11-15, EW samples for each (tubes) plus dump site water EW-1 Standard Elutriate Tests (100-267-1-8, 100-270-1-12)
January 1974 - Bulk Sediment Analysis (6)	West River PE-1-6 Tests Run: C-H-N's (12)
June 1978 - Bulk Sediment Analysis and Bioassay (3)	GE-1-3 Lab Series: 100-279-1,3,5 Tests: Limits, COD, Volatile Solids, C-H-N's, Pb, Zn, Hg, As, Cd, Cr, Cu, Ni, V.
Elutriate Testing	GE-1-2-3 Standard Elutriate Testing

NEW HAVEN HARBOR (Continued)

Environmental Smpling History

August 1978 - Bulk Sediment Analysis (37)	GE-1-37 Lab Series: 100-284-1-37 Tests Run: Atterburg Limits, grain size analysis. (Grab samples sent to EPA).
September 1980 - Bulk Sediment Analysis	(See Mill and Quinnipiac Rivers Section)

NEW HAVEN HARBOR

Parameter	Organic Silts			Sands & Gravels		
	1970	1971 inner	1971 outer		1971 inner	1971 outer
% Volatile Solids - EPA		7.831	4.699	none	2.487	0.89
% Volatile Solids - NED	5.82	6.168	3.363		1.92	0.54
% Total Volatile Solids		13.131	7.656		9.887	2.184
PPM Chem. Oxygen Demand		120,712	64,657		44,689	8820
PPM Total Kjeldahl Nitrogen		3341	1529		600	156
PPM Oil and Grease		4937	1653		1403	674
# of tests on parameters above / # of tests on parameters below	(4)	(17)/(33)	(7)/(13)		(9)/(16)	(5)/(9)
PPM Mercury		0.438	2.043		0.094	0.040
PPM Lead	29.65	117.3	27.1		18.4	7.478
PPM Zinc	65.8	323.2	81.8		74.8	21.3
PPM Arsenic						
PPM Cadmium	0					
PPM Chromium	43.08					
PPM Copper	52.05	257.6			58.4	
PPM Nickel	11.43					
PPM Vanadium						
% Total Carbon	3.218					
% Hydrogen	0.643					
% Nitrogen	0.068					
PPB DDT						
PPB PCB						

NEW HAVEN HARBOR

Parameter	Organic Silts			Sands & Gravels		
	1973	1977	1978	1973	1977	1978
% Volatile Solids - EPA		8.825	8.983	none	1.6	none
% Volatile Solids - NED		6.10	6.010		0.8	
% Total Volatile Solids		13.483	9.263		2.93	
PPM Chem. Oxygen Demand		124,025	81,108		16,400	
PPM Total Kjeldahl Nitrogen		4683	4093		310	
PPM Oil and Grease		6080	2405		340	
# of tests on parameters above # of tests on parameters below	(11)	(4)	(3)		(1)	
PPM Mercury		0.76	0.637		0.25	
PPM Lead		137.5	118.5		17.0	
PPM Zinc		364.8	244.6		41.0	
PPM Arsenic		8.78	6.4		2.0	
PPM Cadmium		3.98	3.23		0.1	
PPM Chromium		246.3	138.7		11.0	
PPM Copper		286.8	173.8		59.0	
PPM Nickel		54.7	48.4		28.0	
PPM Vanadium		75.8	61.3		5.0	
% Total Carbon	2.098		3.303			
% Hydrogen	0.506		0.903			
% Nitrogen	0.215		0.357			
PPB DDT						
PPB PCB						

NEW HAVEN HARBOR

SUMMARY OF ELUTRIATE TEST RESULTS

* Number in ( ) is number of cases

TEST PARAMETER	DREDGE SITE WATER		SEDIMENT ELUTRIATE	
	1973 (1)*	1978 (3)	1973 (11)	1978 (9)
Nitrite Nitrogen (PPM)	0.003	0.273	0.008	0.170
Nitrate Nitrogen (PPM)	0.120	0.240	0.060	0.150
Sulfate (SO_4) (PPM)	2150	1991	1859	1650
Oil & Grease (PPM)	0.00	5.00	4.00	5.00
Phosphorus - Ortho (PPM)	0.075	0.017	0.241	0.346
Phosphorus - Total (PPM)	0.100	0.027	0.374	0.387
HEAVY METALS				
Mercury ** (PPB)	0.20	0.20	0.26	0.20
Lead	0.500	0.005	0.582	0.005
Zinc	0.020	0.029	0.030	0.002
Arsenic	0.017	0.008	0.023	0.021
Barium				
Berylium				
Cadmium	0.005	0.001	0.004	0.001
Chromium	0.050	0.005	0.073	0.005
Copper	0.100	0.006	0.126	0.002
Nickel	0.000	0.005	0.001	0.007
Selenium				
Silver				
Vanadium	0.005	0.005	0.007	0.005
ORGANOHALOGENS				
Total PCB, (ppt)				
Total DDT, (ppt)				

** All heavy metal values are in parts per million except Mercury.

NEW HAVEN HARBOR

SUMMARY OF ELUTRIATE TEST RESULTS

* Number in ( ) is number of cases

TEST PARAMETER	WATER: NEW HAVEN DUMP * 1977 (1)	WATER: DREDGE SITE 1977 (5)	SEDIMENT ELUTRIATE 1977 (5)	
Nitrite Nitrogen (PPM)	0.010	0.013	0.016	
Nitrate Nitrogen (PPM)	0.100	0.180	0.100	
Sulfate (SO_4) (PPM)	2250	2190	1950	
Oil & Grease (PPM)	1.00	0.72	0.50	
Phosphorus - Ortho (PPM)	0.050	0.092	0.442	
Phosphorus - Total (PPM)	0.070	0.116	0.514	
HEAVY METALS				
Mercury ** (PPB)	0.20	0.36	0.20	
Lead	0.004	0.004	0.004	
Zinc	0.039	0.020	0.005	
Arsenic	0.003	0.005	0.008	
Barium				
Berylium				
Cadmium	0.003	0.001	0.001	
Chromium	0.004	0.004	0.004	
Copper	0.029	0.016	0.001	
Nickel	0.004	0.004	0.004	
Selenium				
Silver				
Vanadium	0.010	0.010	0.010	
ORGANOHALOGENS				
Total PCB, (ppt)				
Total DDT, (ppt)				

** All heavy metal values are in parts per million except Mercury.

NEW HAVEN HARBOR Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
K-5-70		N	86.5				2.591				
K-15		N	93.5								
K-30		B	52.5				2.577				
K-36		B	87.0								
Mean-1970			79.9				2.584				
KE-1-71							2.617	77.66	38.52	39.99	
KE-1 lower							2.526				
KE-2							2.666	84.41	53.63	58.54	
KE-3							2.660		60.62	67.04	
KE-3 lower							2.629	95.39	74.67	72.18	
KE-4							2.620	71.48	26.53	34.65	
KE-5							2.648	114.06	93.77	79.81	
KE-6							2.640	115.62	94.96	94.71	
KE-7							2.677	114.93	79.93	81.19	
KE-8							2.612	63.62	20.91	33.42	
KE-9							2.662	111.38	62.55	35.32	
KE-10							2.541	78.04	28.97	31.46	
KE-11 T1							2.487	69.17	24.60	31.69	
KE-11 T2							2.660	114.31	79.47	70.15	

NEW HAVEN HARBOR Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
KE-12							2.572	71.67	28.16	33.90	
KE-13							2.677	105.69	87.03	80.56	
KE-14							2.589	88.53	41.53	41.52	
KE-15							2.622	67.11	24.35	29.16	
KE-16							2.756	121.24	83.84	76.25	
KE-17							2.711	74.29	25.16	34.86	
KE-18 T1							2.708	85.22	45.51	48.15	
KE-18 T2							2.683	89.77	46.70	50.04	
KE-19							2.645	84.09	44.02	46.26	
KE-20							2.599	72.61	22.29	22.94	
KE-21							2.646	75.10	30.28	32.69	
KE-22							2.511	87.90	41.40	45.80	
KE-23							2.659	69.80	29.40	36.96	
Mean-1971							2.630	88.12	49.56	50.36	
NEW HAVEN OUTER HARBOR											
KE-24							2.629	83.91	44.08	52.81	
KE-25 T1							2.613	99.95	69.42	63.82	
KE-25 T1 lower							2.647			76.43	
KE-25 T2							2.664	108.44	92.83	85.80	

NEW HAVEN HARBOR Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
KE-26							2.663	120.12	93.96	78.89	
KE-27							2.663	119.87	98.83	81.54	
KE-28 T1							2.640	107.13	89.34	81.73	
KE-28 T2							2.709	142.03	122.18	83.49	
KE-29							2.653	84.41	47.26	40.89	
KE-30							2.667	82.28	54.24	47.41	
KE-31							2.624	78.72	32.28	41.82	
KE-32							2.630	74.10	34.15	42.34	
KE-33							2.693	74.79	32.78	40.73	
Mean-1971							2.653	97.97	66.50	63.92	

NEW HAVEN HARBOR Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
PE-1/FD-5-77	M	B	100.00	139	52	87	2.58	70.70	16.20	22.87	
PE-5/FD-5	M	B	100.00	138	56	82	2.56	80.00	29.50	36.70	
PE-1/FD-7	M	B	100.0	126	46	80	2.64	73.00	22.00	30.30	
PE-1/FD-8	M							93.70	49.90	52.60	
PE-1/FD-9	S	N	4.00				2.69	112.70	83.80	71.40	
Mean-1977			76.00	134.3	51.3	83.0	2.61	86.02	40.28	42.77	
GE-1-78	C	B	98.60	112	42	70	2.59			34.16	
GE-2	C	B	96.40	117	46	71	2.59			30.44	
GE-3	C	B	95.50	113	44	69	2.56			33.60	
Mean-1978			96.83	114	44	70	2.58			32.73	
GE-1-78		N	96.00	107	45	62	2.64				
GE-2		B	61.00	69	33	36	2.64				
GE-3		B	60.00	89	36	53	2.65				
GE-4		B	78.00	106	45	61	2.56				
GE-5		B	73.00	97	45	52	2.58				
GE-6		N	97.00	127	51	76	2.60				
GE-7		N	97.50	118	47	71	2.61				
GE-8		N	96.50	130	48	82	2.57				

NEW HAVEN HARBOR Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
GE-29		N					2.66				
GE-30		N					2.68				
GE-31		N		119	46	73	2.61				
GE-32		N		111	43	68	2.63				
GE-33		N					2.67				
GE-34		N		42	42	19	2.67				
GE-35		N					2.70				
GE-36		N					2.70				
GE-37		N					2.68				
Mean-1978			74.37	92.30	38.95	53.35	2.64				
PROJECT MEAN			37.13	99.65	40.96	58.69	2.634	88.58	53.21	52.18	

NEW HAVEN HARBOR

WEST RIVER CHANNEL

The West River at New Haven is a mainly recreational section of the harbor. The project is also utilized by several commercial concerns located at City Point. The Federal project consists of a 12-foot channel extending west from the 16-foot inner harbor anchorage to a 6-foot anchorage at West Haven, and then northward up the West River to the Interstate 95 bridge.

Environmental sampling and testing were undertaken in 1969, 1972 and 1974. Sampling in 1969 consisted of one tube sample taken in the channel at the west end of the 6-foot anchorage. The sample was tested for volatile solids and yielded a normal value.

Sampling in 1972 consisted of seven tube samples and one grab sample (taken at the eastern end of the channel). One sample taken in the far upper portion of the project channel showed an abnormally high value for lead. The two samples at the upstream end of the project also showed moderately high values for volatile solids, chemical oxygen demand, mercury, lead and zinc. Moderately high values for mercury and zinc were found in the middle section of the project (PE-4, 5).

Sampling in 1974 consisted of six tube samples which underwent elutriate analysis as well as percent C-H-N testing. None of the samples tested showed any significantly high values.

NEW HAVEN HARBOR

WEST RIVER

ENVIRONMENTAL SAMPLING HISTORY

February 1969 - Bulk Sediment Analysis (1)	PE-17 Lab Series: 27-790-12 Tests Run: Limits, Volatile solids (NED).
April 1972 - Bulk Sediment Analysis (8)	PE-1→7 (Tubes) GE-8 (Grab) Lab Series: 100-70-1→15 Tests Run: COD, Volatile Solids, Unit Weights, 2 levels each - Zn, Pb, Hg, Cd, Cr, Cu, PCB(1), DDT(1).
January 1974 - Bulk Sediment Analysis (6)	PE-1→6 Lab Series: 100-129-1→6 Tests Run: 2 levels - C-H-N's
- Elutriate Analysis (6)	PE-1→6 Tests Run: Standard elutriate testing with New Haven Dumpsite water.

NEW HAVEN - WEST RIVER

Parameter	Organic Silts			Sands & Gravels		
	1972	1974	1969	1972	1974	1969
% Volatile Solids - EPA	9.120			none	none	none
% Volatile Solids - NED	7.355					
% Total Volatile Solids	17.523					
PPM Chem. Oxygen Demand	165,338					
PPM Total Kjeldahl Nitrogen	3063					
PPM Oil and Grease	8818					
# of tests on parameters above # of tests on parameters below		(12)	(1)			
PPM Mercury	15.87					
PPM Lead	309.8		9.09			
PPM Zinc	512.6					
PPM Arsenic	10.4					
PPM Cadmium	244.3					
PPM Chromium	289.9					
PPM Copper						
PPM Nickel						
PPM Vanadium						
% Total Carbon		4.141				
% Hydrogen		0.912				
% Nitrogen		0.429				
PPB DDT						
PPB PCB						

NEW HAVEN - WEST RIVER

SUMMARY OF ELUTRIATE TEST RESULTS

* Number in ( ) is number of cases

TEST PARAMETER	NEW HAVEN DUMP WATER * 1974 (1)		SEDIMENT ELUTRIATE 1974 (12)	
Nitrite Nitrogen (PPM)	0.000		0.005	
Nitrate Nitrogen (PPM)	0.190		0.040	
Sulfate (SO_4) (PPM)	2150		1746	
Oil & Grease (PPM)	10.70		8.28	
Phosphorus - Ortho (PPM)	0.060		0.133	
Phosphorus - Total (PPM)	0.140		0.266	
HEAVY METALS				
Mercury ** (PPB)	0.30		0.29	
Lead	0.005		0.005	
Zinc	0.020		0.010	
Arsenic	0.005		0.012	
Barium				
Berylium				
Cadmium	0.001		0.0011	
Chromium	0.005		0.005	
Copper	0.010		0.005	
Nickel	0.008		0.011	
Selenium				
Silver				
Vanadium	0.020		0.020	
ORGANOHALOGENS				
Total PCB, (ppt)				
Total DDT, (ppt)				

** All heavy metal values are in parts per million except Mercury.

NEW HAVEN WEST RIVER Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
PE-1-72			94.00	126	52	74	2.647	74.92	23.10	29.70	
PE-2			99.00	108	49	59	2.462	75.85	22.47	28.06	
PE-3			89.00	116	46	70	2.573	78.66	27.09	32.73	
PE-4			99.00	108	46	62	2.606	79.35	32.78	36.10	
PE-5			99.00	110	48	62	2.580	79.04	29.22	28.32	
PE-6			87.00	100	41	59	2.540	85.97	46.45	32.82	
PE-7			99.00	73	39	36	2.631	97.52	49.76	41.83	
GE-8			86.00	95	44	49	2.657		39.09	39.09	
Mean-1972			94.00	104.5	45.6	58.8	2.587	81.61	31.66	33.58	

NEW HAVEN HARBOR

MILL RIVER

The Mill River at New Haven Harbor, CT is utilized mainly by commercial interests. The Federal project consists of a twelve foot channel extending from the Quinnipiac River about 2000 feet to the fork where it branches into two channels which extend northward up the East and West Branches of the Mill River.

Environmental sampling and testing were undertaken in 1969 and 1980. Sampling in 1969 consisted of fifteen tube samples, four from the East Branch, five from the West Branch and six from the main Mill River channel. All of the samples were analyzed for physical parameters. Samples PE-2, 9, 12 and 14 were tested for volatile solids and all showed an abnormally high value for that parameter.

NEW HAVEN HARBOR

MILL AND QUINNIPIAC RIVERS

ENVIRONMENTAL SAMPLING HISTORY

February 1969 - Bulk Sediment Analysis (16)	PE-1→15 (Mill River) PE-16 (Quinnipiac) Lab Series: 27-790-1→11, 14 27-792-1→4 Tests Run: Unit Weights, Volatile solids (5).

MILL RIVER

NEW HAVEN HARBOR

Parameter	Organic Silts			Sands & Gravels		
	1969	1980		1969	1980	
% Volatile Solids - EPA				NONE		
% Volatile Solids - NED	35.25					
% Total Volatile Solids						
PPM Chem. Oxygen Demand						
PPM Total Kjeldahl Nitrate						
PPM Oil and Grease						
#of tests on parameters above #of tests on parameters below	(4)					
PPM Mercury						
PPM Lead						
PPM Zinc						
PPM Arsenic						
PPM Cadmium						
PPM Chromium						
PPM Copper						
PPM Nickel						
PPM Vanadium						
% Total Carbon						
% Hydrogen						
% Nitrogen						
PPB DDT						
PPB PCB						

NEW HAVEN HARBOR Sample MILL RIVER	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf).	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
PE-1-69								58.04	6.39		
PE-2							2.000		8.98		
PE-3								44.69			
PE-4									7.95		
PE-5									8.38		
PE-6									14.70		
PE-7								61.07	9.16		
PE-8									9.60		
PE-9							2.079		11.34		
PE-10									8.61		
PE-11									14.90		
PE-12							2.247		7.86		
PE-13									8.42		
PE-14							2.159		6.46		
PE-15									7.59		
Mean 1969							2.121	54.60	9.31		
PE-1-80											

NEW HAVEN HARBOR

QUINNIPIAC RIVER

The Quinnipiac River at New Haven Harbor, Connecticut is chiefly utilized by commercial interests. The Federal project consists of an 18-foot channel extending from the head of the 35-foot New Haven Harbor channel, up the Quinnipiac River about 4,200 feet to the Ferry Street bridge. A 16-foot channel extends north from the Ferry Street bridge about 2,600 feet to the Grand Avenue bridge.

Environmental sampling and testing was undertaken in 1969 and 1980. Sampling in 1969 consisted of one tube sample taken in the upper end of the 16-foot channel just south of the Grand Avenue bridge. The sample was analyzed for volatile solids and yielded a normal value.

QUINNIPIAC RIVER

NEW HAVEN HARBOR

Parameter	Organic Silts			Sands & Gravels		
	1969	1980		1969	1980	
% Volatile Solids - EPA				NONE		
% Volatile Solids - NED	4.33					
% Total Volatile Solids						
PPM Chem. Oxygen Demand						
PPM Total Kjeldahl Nitrate						
PPM Oil and Grease						
#of tests on parameters above #of tests on parameters below	(1)					
PPM Mercury						
PPM Lead						
PPM Zinc						
PPM Arsenic						
PPM Cadmium						
PPM Chromium						
PPM Copper						
PPM Nickel						
PPM Vanadium						
% Total Carbon						
% Hydrogen						
% Nitrogen						
PPB DDT						
PPB PCB						

NEW HAVEN HARBOR Sample QUINNIPIAC RIVER	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
PE-16-69							2.740	94.14	58.25		
PE-1-80											

NEW LONDON HARBOR AND THAMES RIVER

ENVIRONMENTAL SAMPLING AND TESTING

NEW LONDON HARBOR
(Below Smith Cove)

New London Harbor, CT, is a major commercial port on eastern Long Island Sound. The harbor is located in the lower portion of the Thames River estuary about 12 miles west of the Rhode Island state line. The Federal project consists of a 33-foot channel, 600-feet wide, extending from the vicinity of the New London Ledge Light in Long Island Sound to the State Pier. A 23-foot channel, 400-feet wide branches west of the 33-foot channel at Fort Trumbull channel and extends into Winthrop Cove and a 100-foot wide channel at the State Pier. An authorized 25-foot channel extends upstream from the upstream limit of the 33-foot channel at the Gold Star Bridge to the Navy Submarine Base. This channel is maintained to 33 feet by the Navy as far north as Smith Cove.

Environmental sampling and testing was undertaken in 1971 and 1975. Sampling in 1971 consisted of 14 Kullenburg samples taken by the NED, and 21 tube samples taken by the Navy. Four of the samples collected by the Navy (N-PF-26,29,34,35) in the vicninity of Mamacoke Hill exhibited moderately high values for volatile solids. None of the samples collected by the NED showed any significantly high values for any of the parameters tested.

Sampling in 1975 consisted of three tube samples and one grab sample taken between the Gold Star Bridge and the northern end of the Navy Submarine Base. The northern most sample, GE-1, exhibited a moderately high value for volatile solids. None of the tube samples showed any significantly high values.

NEW LONDON HARBOR AND THAMES RIVER

Environmental Sampling History

November 1971 - Bulk Sediment Analysis (14) KE-1-14

Lab Series: 100-51-1-37

Tests Run: Unit Weights, O&G Volatile Solids, COD, TKN, 2 levels each sample (Hg, Pb, Zn, Cu), grain size analysis.

August 1971 - U.S. Navy Samples

Bulk Sediment Analysis (21) N-1-4,6-10,12,17,19,21, 23,26,29,31,32,34-36

Tests Run: Volatile Solids, COD, TKN, Pb, Zn, Hg, (24 each), O&G.

April 1973 - Thames River above Sub base

Bulk Sediment Analysis (13) GE-1-13

Lab Series: 100-114-1-9, 100-115-1-4

Tests Run: Limits, Volatile Solids, COD, TKN, 13 each -Hg, Pb, Zn, As, Cd, Cr, Cu, Ni, V, PCB (2), DDT (2), grain size analysis.

August 1975 - Bulk Sediment Analysis (4) GE-1, PE-2,3,4

Lab Series: 100-197-1-4

Tests Run: grain size analysis; Limits, unit weights, Volatile solids (EPA only).

NEW LONDON HARBOR AND THAMES RIVER (Continued)

Environmental Sampling History

November 1978 - Shaws Cove

Bulk Sediment Analysis (4)	PE-1, GE-B-1,2,3 Lab Series: 100-287-1-11 Tests Run: Unit Weights, Limits, Volatile Solids, COD, TKN, Hg, Pb, Zn, As, Cd, Cr, Cu, Ni, V, (4 each), C-H-N's (3) PCB (1), DDT(1), grain size analysis.
Standard Elutriate	Standard Elutriate Testing
Bioassay	Bioassay (Corps)

NEW LONDON HARBOR

Parameter	Organic Silts			Sands & Gravels		
	1971	1971*	1975	1971	1971*	1975
% Volatile Solids - EPA	3.084	7.56	8.95	2.437	--	None
% Volatile Solids - NED	2.192			1.77		
% Total Volatile Solids	5.661			4.607		
PPM Chem. Oxygen Demand	44,300	61,500		33,567		
PPM Total Kjeldahl Nitrate	867	1,823		667		
PPM Oil and Grease	1,491	1,171		683		
#of tests on parameters above / #of tests on parameters below	(11)/ (22)	(24)	(4)	(3)/ (6)		
PPM Mercury	0.101	0.045		0.085		
PPM Lead	26.6	45.5		23.6		
PPM Zinc	58.7	35.2		55.2		
PPM Arsenic						
PPM Cadmium						
PPM Chromium						
PPM Copper	26.7			25.5		
PPM Nickel						
PPM Vanadium						
% Total Carbon						
% Hydrogen						
% Nitrogen						
PPB DDT						
PPB PCB						

*Samples collected by U.S. Navy (sand and silt samples combined)

NEW LONDON HARBOR Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
KE-1-71			44.00				2.671	180.00	79.00	70.36	
KE-2			97.00				2.629	85.50	48.00	59.57	
KE-3			97.00				2.630	92.40	46.60	56.96	
KE-4			23				2.659	107.40	79.70	63.46	
KE-4 lower			32				2.692				
KE-5			47				2.731	104.30	75.30	70.27	
KE-6			48				2.712	91.60	64.60	64.45	
KE-7			67				2.619	106.20	74.90	69.58	
KE-8			80				2.673	88.30	60.60	63.66	
KE-9			80				2.716	95.70	64.30	66.20	
KE-10			90				2.686	89.50	55.10	61.09	
KE-11			98				2.698	102.10	67.20	67.99	
KE-12			99				2.697	92.20	58.70	60.46	
KE-13			99				2.680	95.60	63.20	67.90	
KE-14			98				2.631	80.80	42.00	51.52	
KE-14 lower			96				2.700				
Mean - 1971			75.25				2.676	95.68	62.80	63.81	

NEW LONDON HARBOR Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf).	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
GE-1-75	OH	N	99.0				2.52				222.0
PE-2	OH	N	95.5	101	47	54	2.59	86.6	39.8		132.5
PE-3	OH	N	95.5	84	45	39	2.60	83.5	39.5		133.0
PE-4	OH	N	91.0	91	51	40	2.58	88.5	37.0		113.0
MEAN-1975			95.3	92	47.7	44.3	2.573	86.2	38.8		150.1
PROJECT MEAN			79.3	92	47.7	44.3	2.655	94.1	58.8	63.81	150.1

SHAWS COVE

NEW LONDON HARBOR

Shaws Cove, at New London Harbor, CT, is utilized by recreational as well as commercial interests including a fuel oil distributor and a scrap metal concern. The project is located about 2.5 miles upstream from the mouth of the Thames river in a cove on the western shore of the estuary. The Federal project consists of a 15 foot entrance channel and 6 acre basin.

Environmental sampling and testing was undertaken in 1978. Sampling in 1978 consisted of one tube sample and three grab samples taken at the northern end of the cove. The three grab samples were used for bioassay testing. The two western most grab samples exhibited abnormally high values for lead and percent total carbon, and moderately high values for chemical oxygen demand and oil and grease. Sample GEB-2 showed abnormally high values for volatile solids, mercury, and zinc, while sample GEB-1 showed only moderately high values for volatile solids and zinc. Sample GEB-3 exhibited no significantly high values for any parameter.

SHAWS COVE

NEW LONDON HARBOR

Parameter	Organic Silts			Sands & Gravels		
	1978			1978		
% Volatile Solids - EPA	12.67			2.78		
% Volatile Solids - NED	10.497			1.15		
% Total Volatile Solids	17.953			4.56		
PPM Chem. Oxygen Demand	172,350			33,100		
PPM Total Kjeldahl Nitrate	3,153			290		
PPM Oil and Grease	11,200			263		
#of tests on parameters above #of tests on parameters below	(3)			(1)		
PPM Mercury	3.617			0.05		
PPM Lead	2,175.0			304.5		
PPM Zinc	990.4			213.3		
PPM Arsenic	14.3			2.2		
PPM Cadmium	4.5			2.2		
PPM Chromium	60.1			11.1		
PPM Copper	263.9			49.9		
PPM Nickel	51.3			16.6		
PPM Vanadium	77.6			11.1		
% Total Carbon	8.47					
% Hydrogen	0.94					
% Nitrogen	0.377					
PPB DDT						
PPB PCB						

SHAWS COVE
NEW LONDON HARBOR

SUMMARY OF ELUTRIATE TEST RESULTS

* Number in ( ) is number of cases

TEST PARAMETER	DREDGE SITE WATER 1978 (3)*		SEDIMENT ELUTRIATE 1978 (9)	
Nitrite Nitrogen (PPM)	0.020		0.027	
Nitrate Nitrogen (PPM)	0.100		0.100	
Sulfate (SO_4) (PPM)	1758		1753	
Oil & Grease (PPM)	5.00		5.33	
Phosphorus - Ortho (PPM)	0.037		0.053	
Phosphorus - Total (PPM)	0.050		0.097	
HEAVY METALS				
Mercury ** (PPB)	0.02		0.02	
Lead	0.005		0.005	
Zinc	0.039		0.029	
Arsenic	0.006		0.003	
Barium				
Berylium				
Cadmium	0.001		0.002	
Chromium	0.005		0.005	
Copper	0.004		0.003	
Nickel	0.007		0.008	
Selenium				
Silver				
Vanadium	0.005		0.005	
ORGANOHALOGENS				
Total PCB, (ppt)				
Total DDT, (ppt)				

** All heavy metal values are in parts per million except Mercury.

NEW LONDON HARBOR Sample SHAWS COVE	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
PE-1-78	S	N	5.7				2.62	134.8	99.0	72.26	
GEB-1	M	N	86.0	74	49	25	2.40			40.96	
GEB-2	M	B	67.7				2.42			36.08	
GEB-3	M	N	76.8				2.64			43.44	
MEAN-1978			59.1				2.52	134.8	99.0	48.19	

THAMES RIVER
(ABOVE SMITH COVE)

NEW LONDON HARBOR

The Thames River, above Smith Cove at New London and Groton, CT, is utilized by both recreational and commercial interests. The Federal project consists of a 25-foot channel 250-feet wide extending north from the upstream limit of the 33 foot Navy yard channel approximately 4.5 miles to Bartlett Point Light, and a 25-foot channel 200-feet wide from Bartlett Point Light to the City of Norwich.

Environmental sampling and testing was undertaken in 1973. Sampling consisted of 13 grab samples taken over the full length of the project channel. One sample (GE-2) taken north of the Long Rock Dike at Norwich exhibited abnormally high values for volatile solids and vanadium, and a moderately high value for chemical oxygen demand. Five samples (GE-3, 6, 7, 10 and 13) showed moderately high values for volatile solids and chemical oxygen demand. Three samples (GE-3, 10 and 13) showed moderately high values for vanadium. Sample GE-10 also exhibited moderately high values for arsenic and PCB concentration, while sample GE-13 also showed a moderately, high value for total kjeldahl nitrogen.

THAMES RIVER

(ABOVE SMITH COVE)

Parameter	Organic Silts			Sands & Gravels		
	1973			1973		
% Volatile Solids - EPA	11.464			4.275		
% Volatile Solids - NED	10.214			3.64		
% Total Volatile Solids	18.27			7.12		
PPM Chem. Oxygen Demand	172,833			65,725		
PPM Total Kjeldahl Nitrate	2,940			1,495		
PPM Oil and Grease	5,878			2,240		
#of tests on parameters above #of tests on parameters below	(9)			(4)		
PPM Mercury	0.873			0.323		
PPM Lead	164.9			68.0		
PPM Zinc	267.1			164.0		
PPM Arsenic	9.7			5.2		
PPM Cadmium	4.4			3.3		
PPM Chromium	142.9			98.3		
PPM Copper	129.2			71.0		
PPM Nickel	53.9			29.0		
PPM Vanadium	99.9			63.5		
% Total Carbon						
% Hydrogen						
% Nitrogen						
PPB DDT	230					
PPB PCB	650					

NEW LONDON THAMES RIVER Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
GE-1-73	S						2.56			40.1	
GE-2	OH	N	81.6	142	82	60	2.43			28.5	
GE-3	OH	B	68.7	152	74	78	2.48			28.4	
GE-4	S	N	9.3				2.71			74.4	
GE-5	S	N	12.8				2.64			70.9	
GE-6	OH	N	90.5	122	62	60	2.49			36.1	
GE-7	OH	N	80.7	93	51	42	2.57			36.0	
GE-8	S	N	43.1				2.58			47.7	
GE-9	OH	N	51.7	57	39	19	2.62			58.6	
GE-10	OH	N	94.8	130	65	65	2.54			35.9	
GE-11	OH	N	93.4	95	47	48	2.63			46.1	
GE-12	OH	N	91.7	122	62	60	2.56			35.5	
GE-13	OH	N	97.8	133	58	75	2.54			29.0	
Mean - 1973			68.0	116.2	59.9	56.3	2.57			43.6	

NIANTIC BAY

ENVIRONMENTAL SAMPLING AND TESTING

NIANTIC BAY

Niantic Bay, CT is a small recreational harbor on Eastern Long Island Sound. Environmental sampling and testing was undertaken in December 1977. Sampling consisted of seven grab samples taken throughout the length of the project channel. None of the samples tested showed any obnormally high or significantly above average values for any of the parameters tested.

NIANTIC BAY AND HARBOR

Environmental Sampling History

January 1977 - Bulk Sediment Analysis (7) GE-1-7

Lab Series: 100-233-1-7

Tests Run: Limits, COD, Volatile Solids, TKN, 7 each - Hg, Pb, Zn, As, Cd, Cr, Cu, Ni, V, grain size analysis.

NIANTIC BAY

Parameter	Organic Silts			Sands & Gravels		
	1977			1977		
% Volatile Solids - EPA	6.03			1.26		
% Volatile Solids - NED	4.49			0.67		
% Total Volatile Solids	10.4			3.49		
PPM Chem. Oxygen Demand	93,100			22,150		
PPM Total Kjeldahl Nitrogen	2,610			508		
PPM Oil and Grease	1,260			255		
# of tests on parameters above # of tests on parameters below	1 sample			6 samples		
PPM Mercury	0.58			0.199		
PPM Lead	46.0			10.0		
PPM Zinc	116.0			23.17		
PPM Arsenic	4.6			0.95		
PPM Cadmium	1.8			1.08		
PPM Chromium	55.0			11.26		
PPM Copper	37.0			5.86		
PPM Nickel	14.0			5.00		
PPM Vanadium	32.0			10.5		
% Total Carbon	4.39					
% Hydrogen	0.17					
% Nitrogen	0.22					
PPB DDT	4.0					
PPB PCB	289.0					

NIANTIC BAY Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
GE-1-76	S	B	10.1				2.66			81.06	
GE-2	S	B	3.2				2.64			80.30	
GE-3	S	B	4.7				2.66			78.94	
GE-4	S	B	5.8				2.66			78.93	
GE-5	S	B	16.1				2.66			73.07	
GE-6	S	B	36.9				2.67			57.36	
GE-7	M	B	71.3	71	43	28	2.59			43.63	
Mean - 1976			21.2	71	43	28	2.65			70.47	

NORWALK HARBOR

ENVIRONMENTAL SAMPLING AND TESTING

NORWALK HARBOR

Norwalk Harbor, CT is a commercial port on Western Long Island Sound. Environmental sampling and testing was undertaken in 1972, 1975, 1977, 1978 and 1979. Sampling in 1972 consisted of eleven tube samples. One sample taken in the East Channel showed abnormally high values (values in excess of two standard deviations above the mean of all North Atlantic Tidal System samples) for Mercury, Lead, and Zinc. Two other samples from widely separated sites showed similarly abnormal Mercury contents. The same East Branch sample showed above average values (values in excess of one standard deviation above the mean) for kjeldahl nitrogen and Copper. One sample taken in the far upper portion of the main channel showed above average values for volatile solids and chemical oxygen demand. Another sample taken just upstream of the first bridge showed above average values for Mercury, Lead and Zinc. Similar above average values for Mercury were also noted throughout the upstream portion of the main channel. Sampling in 1975 consisted of 15 tube samples. Abnormally high values for Mercury concentration were found in samples taken in the lower portion of the West Branch and the far upper portion of the East Branch. Samples taken in the far upper East Branch also showed above average values for volatile solids, chemical oxygen demand, kjeldahl nitrogen, Mercury and Vanadium. Above average values for volatile solids, chemical oxygen demand, Mercury, Lead, Zinc, Arsenic and Nickel were found throughout the West Branch. Sampling in 1977 consisted of 23 tube samples tested for physical parameters only and 11 tube samples tested for nitrobenzene and napthalene. These 11 samples

were concentrated in the West Branch channel opposite the King Chemical Company. Sampling in 1978 consisted of three grab samples tested for Elutriate as well as chemical testing and Bioassay. These samples showed above average values for kjeldahl nitrogen, Mercury and percent carbon. Samples taken in 1979 consisted of 18 tube samples. Samples taken in the far upper end of both the East Branch and the West Branch showed abnormally high values for Mercury content. Samples taken in the lower West Branch also showed abnormally high values for chemical oxygen demand and volatile solids. Samples from the far upper and lower West Branch also showed abnormally high values for percent hydrogen and percent nitrogen. Samples throughout the entire West Branch showed above average values for volatile solids, chemical oxygen demand, total kjeldahl nitrogen, Mercury and Zinc.

NORWALK HARBOR

Environmental Sampling History

March 1972 - Bulk Sediment Analysis (11)	PE-1-11 Lab Series: 100-67-1-21 Tests Run: Unit Weights, Limits, Volatile Solids, COD, O&G, TKN, 2 levels each heavy metal - (Hg, Pb, Cd, Cr, Cu), PCB(4), DDT(4), grain size analysis.
July 1975 - Bulk Sediment Analysis (15)	PE-1→15 Lab Series: 100-203-1→17 Tests Run: Unit Weights, Limits COD, Volatile Solids, TKN, O&G, 2 levels each - Hg, Pb, Zn, As, Cd, Co, Cu, Ni, V, C-H-N's(14), PCB(1), DDT(1), grain size analysis.
March 1977 - EPA Nitrobenzene Testing	PE-1→34 EW-1→5 Tests Run: PPM-Nitrobenzene, PPM-Naphtaline by EPA - Lexington Lab.
June 1978 - Bulk Sediment Analysis (3)	GEB-1,2,3, EW-1,2,3 Lab Series: 100-281-1→5 Tests Run: Limits, Volatile Solids, COD, TKN, O&G, Hg, Pb, Zn, Cd, Cr, Cu, Ni, V, As (3 each), C-H-N's(3), grain size analysis.
Standard Elutriate	Standard Elutriate with EW-1,2,3 PCB(1) and DDT(1).
Bioassay	Bioassay (JBF Scientific - August)

PATCHOQUE RIVER

Patchoque River, CT is a mainly recreational project located on Eastern Long Island Sound. Environmental sampling and testing was undertaken in 1971, 1976 and 1977. Testing in 1977 was for Elutriate testing only. Sampling in 1971 consisted of ten tubes taken throughout the project. Sampling in 1976 consisted of four tube samples. Samples taken in 1971 in the far upper end of the project channel showed above average values (values in excess of one standard deviation above the mean of all North Atlantic Tidal System samples) for the parameters volatile solids and kjeldahl nitrogen. Samples taken in 1975 in the upper end of the project channel showed above average values for Nickel. All samples taken in both years for the lower end of the project showed no significantly high values for the parameters tested.

NORWALK HARBOR

Parameter	Organic Silts			Sands & Gravels		
	1972	1975	1978	1972	1975	1978
% Volatile Solids - EPA	8.524	9.793	10.44	1.84	1.965	none
% Volatile Solids - NED	7.174	8.773	7.26	1.44	1.573	
% Total Volatile Solids	14.543	15.528	14.133	21.62	4.163	
PPM Chem. Oxygen Demand	134,940	145,142	131,000	207,200	29,027	
PPM Total Kjeldahl Nitrogen	3100	4002	4516	300	847	
PPM Oil and Grease	8032	7187	5753	12,300	677	
# of tests on parameters above / # of tests on parameters below	(10)/(20)	(12)/(24)	(3)	(1)/(2)	(3)/(6)	
PPM Mercury	2.431	2.434	1.63	0.865	0.179	
PPM Lead	324.7	262.8	266.6	155.0	60.6	
PPM Zinc	481.9	441.5	379.5	241.7	77.8	
PPM Arsenic		9.93	6.97		2.35	
PPM Cadmium	4.68	6.97	4.10	2.55	2.23	
PPM Chromium	147.9	192.5	123.8	53.1	36.2	
PPM Copper	289.4	335.4	299.9	91.0	63.7	
PPM Nickel		83.3	65.4		29.5	
PPM Vanadium		74.9	82.37		24.4	
% Total Carbon		4.390			1.25	
% Hydrogen		0.823			0.235	
% Nitrogen		0.391			0.095	
PPB DDT						
PPB PCB						

NORWALK HARBOR

Parameter	Organic Silts			Sands & Gravels		
	1979			1979		
% Volatile Solids - EPA	9.355			2.21		
% Volatile Solids - NED	6.611			1.41		
% Total Volatile Solids	17.934			6.275		
PPM Chem. Oxygen Demand	169,420			50,550		
PPM Total Kjeldahl Nitrogen	4038			1055		
PPM Oil and Grease	4257			3315		
# of tests on parameters above # of tests on parameters below	(15)			(2)		
PPM Mercury	2.694			2.05		
PPM Lead	111.6			169.5		
PPM Zinc	355.4			143.5		
PPM Arsenic	7.75			2.05		
PPM Cadmium	6.67			3.0		
PPM Chromium	84.3			17.5		
PPM Copper	201.7			46.0		
PPM Nickel	50.4			22.5		
PPM Vanadium	40.9			13.5		
% Total Carbon	0.373			0.25		
% Hydrogen	4.954			5.02		
% Nitrogen	0.732			0.63		
PPB DDT						
PPB PCB						

NORWALK HARBOR

SUMMARY OF ELUTRIATE TEST RESULTS

* Number in ( ) is number of cases

TEST PARAMETER	DREDGE SITE WATER		SEDIMENT ELUTRIATE	
	1978 (3)*	1979 (13)	1978 (9)	1979 (39)
Nitrite Nitrogen (PPM)	0.010	0.018	0.010	0.025
Nitrate Nitrogen (PPM)	0.100	0.770	0.100	0.450
Sulfate (SO_4) (PPM)	1550	965	1272	985
Oil & Grease (PPM)	5.00	8.50	5.00	9.15
Phosphorus - Ortho (PPM)	0.070	0.054	0.578	0.663
Phosphorus - Total (PPM)	0.077	0.062	0.570	0.583
HEAVY METALS				
Mercury ** (PPB)	0.20	0.27	0.20	0.08
Lead	0.005	0.005	0.005	0.005
Zinc	0.035	0.095 (12)	0.012	0.101
Arsenic	0.002	0.006	0.025	0.011
Barium				
Berylium				
Cadmium	0.0013	0.0015	0.004	0.0011
Chromium	0.005	0.010	0.005	0.010
Copper	0.007	0.009	0.002	0.006
Nickel	0.022	0.005	0.013	0.006
Selenium				
Silver				
Vanadium	0.005	0.045	0.005	0.064
ORGANOHALOGENS				
Total PCB, (ppt)				
Total DDT, (ppt)				

** All heavy metal values are in parts per million except Mercury.

NORWALK HARBOR Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
PE-1-72			95	117	54	63	2.515	86.5	33.2	37.28	
PE-2			79	95	46	49	2.559	61.1	25.2	44.97	
PE-3			96	117	57	60	2.537	79.1	28.3	36.86	
PE-4			96	132	56	76	2.581	78.9	25.6	25.85	
PE-4 lower			96	92	46	46	2.630				
PE-5			96	105	49	56	2.592	79.9	30.8	37.00	
PE-6			85	73	39	34	2.628	90.3	41.6	46.92	
PE-7			93	123	55	68	2.615	73.5	24.9	34.39	
PE-8			96	92	55	37	2.551	78.8	28.8	33.65	
PE-9			81	95	57	38	2.530	79.8	30.7	36.88	
PE-10			1.0				2.567	99.5	55.6	71.41	
PE-10 lower			41	82	54	28	2.710				
PE-11			93	128	56	72	2.575	79.9	24.3	32.73	
Mean - 1972			80.6	104.3	52	52.3	2.584	80.7	31.7	39.81	
PE-1-75	M	N	93.1	119	52	67	2.54	80.3	29.3	33.73	
PE-2	M	N	94.2	105	51	54	2.59	85.8	33.9	36.07	
PE-3	M	N	95.0	104	42	62	2.60	83.8	33.0	38.03	
PE-4	M	N	98.4	116	46	70	2.63	85.3	32.0	36.29	
PE-5	C	N	99.1	128	45	83	2.60	80.7	28.3	33.76	

NORWALK HARBOR Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
PE-6-75	M	N	93.8	158	58	100	2.54	72.9	19.9	25.38	
PE-7	C	N	87.5	85	36	49	2.66	95.4	44.8	45.39	
PE-8	S	N	40.2	48	30	18	2.65	125.3	87.7	62.65	
PE-9	S	N	19.9	42	24	18	2.69	131.2	100.4	71.13	
PE-10	M	N	87.6	120	48	72	2.48	86.2	35.7	42.44	
PE-11	M	N	95.3	121	48	73	2.54	87.5	31.2	33.91	
PE-12	M	N	96.8	124	52	72	2.53	80.9	27.4	34.55	
PE-13	M	N	96.6	121	53	68	2.52	80.2	26.2	33.94	
PE-14	M	N	75.2	80	48	32	2.47	78.5	29.7	35.97	
PE-15	S	N	5.5				2.66	123.2	81.6	80.32	
PE-15 lower	M	N	63.2	66	48	18	2.63			77.39	
Mean - 1975			77.6	102.5	45.4	57.1	2.58	91.8	42.7	45.06	
GE-1-78	M	B	98.9	129	49	80	2.57			30.98	
GE-2	M	B	78.9	108	44	64	2.59			35.79	
GE-3	M	B	97.6	136	53	83	2.56			27.88	
Mean - 1978			91.8	124.3	48.7	75.7	2.57			31.55	
PE-1-79	M	B	96.6	141	54	87	2.55	73.4	22.3	30.50	228.69
PE-2-79	M	B	98.4	128	56	72	2.58	76.7	27.5	35.76	179.05

NORWALK HARBOR Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
PE-3-79	M	B	97.7	132	52	80	2.58	73.9	25.7	34.77	187.37
PE-4	M	B	97.9	126	51	75	2.57	69.6	24.5	35.31	184.25
PE-5	M	B	98.6	119	49	70	2.61	75.3	27.1	36.17	177.94
PE-6	M	B	98.4	108	46	62	2.63	77.6	29.7	38.22	161.73
PE-7	M	N	93.8	123	52	71	2.53	75.0	27.7	34.63	170.60
PE-8	S	N	12.0	76	36	40	2.65	105.6	75.8	71.51	39.25
PE-9	S	N	99.0	86	44	42	2.64	72.0	34.2	47.65	
PE-10	M	N	95.9	105	45	60	2.62	76.9	30.2	39.09	
PE-11	M	N	91.4	117	48	69	2.58	77.7	29.9	38.41	
PE-12	M	N	82.4	89	53	36	2.54	78.4	29.5	37.93	
PE-13	M	N	91.5	102	47	55	2.55	78.3	29.9	38.22	
PE-14	M	N	80.3	102	46	56	2.58	79.5	32.5	39.69	
PE-15	M	N	97.2	114	48	66	2.53	75.7	27.5	36.15	
PE-16	G										
PE-17	S	N	28.0	56	35	21	2.63	109.4	74.0	64.86	
PE-18	M	N	87.7	125	55	70	2.37	65.4	20.0	30.32	
Mean - 1979			85.1	108.8	48.1	60.7	2.57	78.8	33.4	40.54	166.11
PROJECT MEAN			81.9	106.6	48.3	58.4	2.58	83.8	59.2	41.33	166.11

PATCHOQUE RIVER

ENVIRONMENTAL SAMPLING AND TESTING

PATCHOQUE RIVER

Patchoque River, CT is a mainly recreational project located on Eastern Long Island Sound. Environmental sampling and testing was undertaken in 1971, 1976 and 1977. Testing in 1977 was for Elutriate testing only. Sampling in 1971 consisted of ten tubes taken throughout the project. Sampling in 1976 consisted of four tube samples. Samples taken in 1971 in the far upper end of the project channel showed above average values (values in excess of one standard deviation above the mean of all North Atlantic Tidal System samples) for the parameters volatile solids and kjeldahl nitrogen. Samples taken in 1975 in the upper end of the project channel showed above average values for Nickel. All samples taken in both years for the lower end of the project showed no significantly high values for the parameters tested.

PATCHOQUE RIVER

Environmental Sampling History

June 1971 - Bulk Sediment Analysis (10)	PE-1-10 Lab Series: 100-20-1-16 Tests Run: Unit Weights, Volatile Solids, COD, TKN, 20 each - Hg, Pb, Zn, grain size analysis.
July 1975 - Bulk Sediment Analysis (4)	PE-1-2,3,4 Lab Series: 100-204-1-4 Tests Run: Unit Weights, Limits, Volatile Solids, COD, TKN, 2 levels each - Hg, Pb, Zn, As, Cd, Cr, Cu, Ni, V, C-H-N's (4), PCB(1), DDT(1), grain size analysis.
March 1977 - Standard Elutriate Testing (3)	PE-1,2,3 EW-1,2,3 Lab Series: 100-236-2-12, Tests Run: Standard Elutriate Tests.

PATCHOGUE RIVER

Parameter	Organic Silts			Sands & Gravels		
	1971	1976		1971	1976	
% Volatile Solids - EPA	9.225	8.793		2.95	2.485	
% Volatile Solids - NED	7.050	6.82		1.75	1.54	
% Total Volatile Solids	13.386	11.091		3.40	3.18	
PPM Chem. Oxygen Demand	123,125	99,700		21,250	19,000	
PPM Total Kjeldahl Nitrogen	3613	2537		600	580	
PPM Oil and Grease	3630	2693		1990	450	
# of tests on parameters above / # of tests on parameters below	(8)/(16)	(3)/(6)		(2)/(4)	(1)/(2)	
PPM Mercury	0.221	0.475		0.09	0.135	
PPM Lead	5.12	89.0		1.84	31.5	
PPM Zinc	6.50	193.8		4.35	79.0	
PPM Arsenic		8.12			2.6	
PPM Cadmium		2.82			1.55	
PPM Chromium		94.5			36.5	
PPM Copper		92.2			39.0	
PPM Nickel		79.7			40.0	
PPM Vanadium		71.3			35.5	
% Total Carbon		3.15			0.32	
% Hydrogen		0.61			0.05	
% Nitrogen		0.25			0	
PPB DDT						
PPB PCB						

PATCHOQUE RIVER Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
PE-1-71							2.51	74.9	23.0	30.9	
PE-2							2.44	95.5	23.2	24.5	
PE-3							2.61	88.1	42.2	48.5	
PE-4							2.63	80.9	33.2	41.6	
PE-5							2.60	79.7	28.8	35.8	
PE-6							2.61	77.3	26.7	34.3	
PE-7							2.68	106.8	71.0	69.5	
PE-7 middle							2.64	106.8	71.0	65.6	
PE-7 lower							2.61	106.8	71.0	62.1	
PE-8							2.65	104.6	68.2	65.9	
PE-9							2.59	89.7	44.0	49.4	
PE-10							2.48	76.5	24.7	31.7	
Mean - 1971							2.59	90.6	43.9	46.65	
PE-1-75	M	N	89.3	81	41	40	2.60	82.4	33.6	39.21	
PE-2	S	N	27.4				2.66	106.3	68.7	64.07	
PE-3	M	N	95.5	123	56	67	2.57	80.4	29.8	34.05	
PE-4	M	N	98.0	100	46	54	2.60	83.8	31.0	35.33	
Mean - 1975			77.6	101.3	47.7	53.7	2.61	88.2	40.8	43.16	
PROJECT MEAN			77.6	101.3	47.7	53.7	2.595	90.0	43.1	45.78	

PAWCATUCK RIVER

ENVIRONMENTAL SAMPLING AND TESTING

PAWCATUCK RIVER

Pawcatuck River, CT is a mainly recreational project located on Eastern Long Island Sound. This river is the state boundary between Connecticut and Rhode Island. Environmental sampling and testing was undertaken in 1971. Sampling consisted of 11 tube samples and 3 grab samples. Samples taken in 1971 in the upper end of the project channel showed abnormally high values (values in excess of two standard deviations above the mean of all North Atlantic Tidal System samples) for volatile solids, chemical oxygen demand, total kjeldahl nitrogen, and Mercury. In addition, samples taken throughout the project channel showed above average values (values in excess of one standard deviation) for volatile solids, chemical oxygen demand total kjeldahl nitrogen and oil and grease.

PAWCATUCK RIVER

Environmental Sampling History

November 1971-Bulk Sediment Analysis (14)

PE-1-6, PE 8-11, GE-1-3

Lab Series: 100-37-1-3,
100-38-1-13,
100-39-1-6

Tests Run: Unit Weights, COD, Volatile Solids, TKN, 19 each-Hg, Pb, Zn, grain size analysis.

Parameter	Organic Silts			Sands & Gravels		
	1971			1971		
% Volatile Solids - EPA	10.713			4.729		
% Volatile Solids - NED	11.452			2.772		
% Total Volatile Solids	19.943			14.145		
PPM Chem. Oxygen Demand	230,740			110,257		
PPM Total Kjeldahl Nitrogen	4820			2086		
PPM Oil and Grease	6602			2819		
# of tests on parameters above # of tests on parameters below	(5)/(8)			(7)/(11)		
PPM Mercury	0.553			1.058		
PPM Lead	92.6			122.9		
PPM Zinc	139.6			136.3		
PPM Arsenic						
PPM Cadmium						
PPM Chromium						
PPM Copper						
PPM Nickel						
PPM Vanadium						
% Total Carbon						
% Hydrogen						
% Nitrogen						
PPB DDT						
PPB PCB						

PAWCATUCK RIVER Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
PE-1-71			92				2.482	79.4	29.1	36.38	
PE-2			94				2.521	78.2	23.2	29.51	
PE-3			72				2.419	82.2	27.0	33.52	
PE-4			72				2.382	85.2	35.1	40.65	
PE-5			10				2.586	88.3	47.1	63.29	
PE-5 lower			50				2.433			46.69	
PE-6			20				2.565	89.5	60.7	68.46	
PE-7			7				2.597	108.4	76.5	70.07	
PE-8			95				2.326	74.3	19.0	25.54	
PE-9			40				2.447	72.0	26.9	37.49	
GE-1											
GE-2			3				2.581			70.84	
GE-3											
PE-10			10				2.628	97.8	66.4	67.89	
PE-10 lower			35								
PE-11			5				2.608	126.4	96.6	71.98	
MEAN-1971			43.2				2.506	89.2	46.1	50.95	

SOUTHPORT HARBOR

ENVIRONMENTAL SAMPLING AND TESTING

SOUTHPORT HARBOR

Southport Harbor, CT is a mainly recreational project located on Western Long Island Sound. Environmental sampling and testing was undertaken in 1972. Sampling consisted of two tube samples at the upper end of the project and three grab samples in the lower end of the project. One tube sample showed an abnormally high value (values in excess of two standard deviations above the mean of all North Atlantic Tidal System samples) for the concentration Nickel. The same sample also showed higher than average values (values in excess of one standard deviation) for Lead and Copper. All other samples tested showed no significantly high values for any parameters.

SOUTHPORT HARBOR

Environmental Sampling History

February 1972 - Bulk Sediment Analysis (5) GE-1,2,5, PE-3,4,

Lab Series: 100-100,1-5,

Tests Run: Unit Weights,

Limits, COD, TKN, Volatile

Solids, 7 each - Hg, Pb, Zn,

As, Cd, Cr, Cu, Ni, V, grain

size analysis.

SOUTHPORT HARBOR

Parameter	Organic Silts			Sands & Gravels		
	1972			1972		
% Volatile Solids - EPA	8.05			0.62		
% Volatile Solids - NED	7.08			0.39		
% Total Volatile Solids	14.15			2.10		
PPM Chem. Oxygen Demand	130,900			7933		
PPM Total Kjeldahl Nitrogen	2850			297		
PPM Oil and Grease	4225			280		
# of tests on parameters above / # of tests on parameters below	(2) / (4)			(3)		
PPM Mercury	0.56			0.04		
PPM Lead	330.9			10.9		
PPM Zinc	215.4			28.57		
PPM Arsenic	9.08			0.53		
PPM Cadmium	3.25			0.5		
PPM Chromium	189.1			6.13		
PPM Copper	446.8			26.43		
PPM Nickel	93.9			5.6		
PPM Vanadium	48.8			7.37		
% Total Carbon						
% Hydrogen						
% Nitrogen						
PPB DDT						
PPB PCB						

SOUTHPORT HARBOR Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
GE-1-72	S	N	1.4				2.748			76.74	
GE-2	S	N	1.2				2.682			76.84	
PE-3	OH	B	55.3	91	54	37	2.601	84.9	40.5	39.62	
PE-4	OH	N	89.1	99	50	49	2.575	84.4	32.8	30.04	
GE-5	S	N	0.0				2.690			82.33	
Mean - 1972			29.4	95	52	43	2.659	84.7	36.7	61.11	

STAMFORD HARBOR

ENVIRONMENTAL SAMPLING AND TESTING

STAMFORD HARBOR

Stamford Harbor, Connecticut is a commercial port on the north shore Western Long Island Sound about seven miles east of the New York state line. The federal project consists of a twelve foot entrance channel from the Sound through the breakwaters to a point west of Jack Island where it branches into two channels, one extending through the hurricane barrier and up the East Branch and one extending up the West Branch to a turning basin at the mouth of the Rippowam River.

Environmental sampling and testing was undertaken in 1971 (East Branch only), 1975 (elutriate tesitng only), 1977, 1978 (East Branch only), and 1979 (East Branch only). The entrance channel has never exhibited any significantly high values for any of the parameters tested.

Sampling in the East Branch in 1971 consisted of sixteen tube samples taken over the entire length of the Branch. The southern most sampled showed abnormally high values for oil and grease and lead. None of the other samples taken below the hurricane barrier showed any ususually high values. Above the barrier abnormally high values were found for all chemical parameters tested, volatile solids, chemical oxygen demand, kjeldahl nitrogen, oil and grease, lead and zinc. Only two of the ten samples above the barrier showed abnormally high values for mercury.

Sampling in the East Branch in 1977 consisted of seven grab samples. Two samples (GE 13 & 14) taken opposite the sewage treatment facility showed abnormally high values for volatile solids, chemical oxygen demand, kjeldahl nitrogen, oil and grease, mercury, lead, and zinc. Sample GE-13 also showed abnormally high values for copper and nickel and alone with GE-12 for arsenic

and cadmium. Sample GE-12 also showed moderately high values for all other parameters except chromium.

Sampling in the East Branch in 1978 consisted of fifteen tube samples and one grab sample which was taken from the northern end of the channel. Of the six samples taken below the hurricane barrier one, PE-10 showed an abnormally high value for mercury and one sample PE-11 showed a moderately high value for vanadium. None of the other samples from below the barrier showed any significantly high values. Above the barrier all samples showed either abnormally high or moderately high values for volatile solids, chemical oxygen demand, kjeldahl nitrogen, oil and grease, mercury, lead, zinc, cadmium, copper, and percent total carbon. One moderately high value for arsenic was noted in sample PE-7 from the upper end of the channel and one abnormally high value for chromium in sample PE-15 from opposite the sewage treatment facility. Four samples from scattered locations also showed moderately high values for vanadium and two samples from opposite the sewage plant also showed moderately high or abnormally high values for nickel.

Sampling in the East Branch in 1979 consisted of 29 tube samples all of which were taken from above the hurricane barrier. Of the nine samples taken between the hurricane barrier and the northern most marinas only one (PE-7) showed any significantly high values, moderately high values for volatile solids, chemical oxygen demand and percent carbon. The remaining twenty samples with one or two exceptions showed abnormally high or moderately high values for volatile solids, chemical oxygen demand, lead, and zinc. Moderately high values for percent total hydrogen and nitrogen were noted in four of the samples taken from opposite the sewage treatment facility.

Sampling in the West Branch for bulk chemical analysis was undertaken only in 1977. Sampling consisted of five grab samples. Two samples GE-9 and 11 showed moderately high values for volatile solids, chemical oxygen demand, and kjeldahl nitrogen. One of these samples GE-11 also showed a moderately high value for lead and another sample GE-9 showed a moderately high value for vanadium. None of the other three samples showed any significantly high values.

STAMFORD HARBOR

Environmental Sampling History

June 1971 - Bulk Sediment Analysis(16)	PE-1-16 Lab Series: 100-16-1→11 100-17-2→20 Tests Run: Unit Weights, Volatile Solids, COD, TKN O&G, 2 levels each sample - Hg, Pb, Zn, grain size analysis.
April 1975 - Elutriate Testing(9)	PE-1-8, GE-9 Lab Series: 100-193-1→25 Tests Run: Standard Elutriate Testing using dump site water EW-1-75(100-194-1).
December 1976 - Bulk Sediment Analysis(16)	GE-1→16 Lab Series: 100-234-1→16 Tests Run: Limits, Volatile Solids, COD, TKN, O&G, 16 each - Hg, Pb, Zn, As, Cd, Cr, Cu, Ni, V, grain size analysis.
Elutriate Testing(6)	GE-2,6,7,11,13,15 Standard elutriate testing using dredge site water EW-2,6, 7,11,13,15, and Dumpsite water EW-1.

June 1978 - Bulk Sediment Analysis(3)	GEB-1,2,3 Lab Series: 100-280-1→5 Tests Run: Limits, Volatile Solids, COD, TKN, O&G, 3 each- Hg, Pb, Zn, As, Cd, Cr, Cu, Ni, V, C-H-N's(3), PCB(1), DDT(1), grain size analysis.
Elutriate Testing	Standard elutriate testing using dredge site water EW-1,2,3
Bioassay	November 1978, Essex Marine Lab, using GEB-1&2
August 1978 - Bulk Sediment Analysis(16)	PE-1→15, GE-6 Lab Series: 100-285-1→16 Tests Run: Unit Weights, Limits, Volatile Solids, COD, TKN, O&G, 15 each - Hg, Pb, Zn, As, Cd, Cr, Cu, Ni, V, C-H-N's(15), PCB(1), DDT(1), grain size analysis.
January 1979 - Bulk Sediemnt Analysis(29)	PE-1→29 Lab Series: 100-290-3→87 Tests Run: Unit Weights, Limits, Volatile Solids, COD, 29 each - Pb, Zn, C-H-N's (29), PCB(4), DDT(4), grain size analysis.

STAMFORD HARBOR

Parameter	Organic Silts			Sands & Gravels		
	1971	1976	1978 B	1971	1976	1978 B
% Volatile Solids - EPA	12.914	11.473	14.00	6.05	8.378	none
% Volatile Solids - NED	9.835	9.062	10.03	4.00	6.423	
% Total Volatile Solids	27.001	19.641	22.70	13.05	15.30	
PPM Chem. Oxygen Demand	261,800	186,867	218,333	119,650	143,000	
PPM Total Kjeldahl Nitrogen	5105	5515	6,148	2050	3613	
PPM Oil and Grease	26,344	10,269	15,753	3400	9830	
# of tests on parameters above / # of tests on parameters below	(14)/(28)	(12)	(3)	(2)/(4)	(4)	
PPM Mercury	1.117	2.644	1.783	0.50	1.978	
PPM Lead	424.7	368.8	562.4	104.0	484.8	
PPM Zinc	660.3	785.0	1306	256.3	731.5	
PPM Arsenic		10.4	9.4		6.9	
PPM Cadmium		14.1	26.2		7.03	
PPM Chromium		192.7	258.3		121.0	
PPM Copper		484.2	739.6		444.5	
PPM Nickel		63.4	99.8		59.3	
PPM Vanadium		88.0	47.6		67.0	
% Total Carbon						
% Hydrogen						
% Nitrogen						
PPB DDT						
PPB PCB						

STAMFORD HARBOR

Parameter	Organic Silts			Sands & Gravels		
	1978	1979		1978	1979	
% Volatile Solids - EPA	13.462	12.480		12.8	9.113	
% Volatile Solids - NED	10.992	10.054		9.61	7.148	
% Total Volatile Solids	20.771	22.896		24.7	17.35	
PPM Chem. Oxygen Demand	198,685	220,568		239,000	167,250	
PPM Total Kjeldahl Nitrogen	4766			5660		
PPM Oil and Grease	23,024			19,600		
# of tests on parameters above # of tests on parameters below	(14)	(25)		(1)	(4)	
PPM Mercury	3.450			1.9		
PPM Lead	445.8	615.2		485.3	714.9	
PPM Zinc	771.4	1218.9		1153	1268.7	
PPM Arsenic	11.32			6.1		
PPM Cadmium	28.0			34.0		
PPM Chromium	239.6			291.2		
PPM Copper	754.1			825		
PPM Nickel	86.8			135.9		
PPM Vanadium	86.1			19.4		
% Total Carbon	6.767	8.310			11.638	
% Hydrogen	1.017	1.000			1.288	
% Nitrogen	0.370	0.344			0.487	
PPB DDT	2.00					
PPB PCB	341.0					

STAMFORD HARBOR

SUMMARY OF ELUTRIATE TEST RESULTS

* Number in ( ) is number of cases Water

TEST PARAMETER	NEW HAVEN DUMP * 1977 (1)	DREDGE SITE 1977 (6)	SEDIMENT ELUTRIATE 1977 (6)	
Nitrite Nitrogen (PPM)	0.010	0.022	0.013	
Nitrate Nitrogen (PPM)	0.210	0.223	0.125	
Sulfate (SO_4) (PPM)	2400	1992	1850	
Oil & Grease (PPM)	0.00	1.42	0.33	
Phosphorus - Ortho (PPM)	0.080	0.299	0.408	
Phosphorus - Total (PPM)	0.085	0.335	0.654	
HEAVY METALS				
Mercury ** (PPB)	0.25	1.16	1.03	
Lead	0.002	0.002	0.003	
Zinc	0.015	0.035	0.017	
Arsenic	0.00	0.001	0.066	
Barium				
Berylium				
Cadmium	0.001	0.001	0.001	
Chromium	0.003	0.003	0.003	
Copper	0.006	0.014	0.006	
Nickel	0.002	0.003	0.008	
Selenium				
Silver				
Vanadium	0.005	0.005	0.005	
ORGANOHALOGENS				
Total PCB, (ppt)				
Total DDT, (ppt)				

** All heavy metal values are in parts per million except Mercury.

STAMFORD HARBOR

SUMMARY OF ELUTRIATE TEST RESULTS

* Number in ( ) is number of cases

TEST PARAMETER	Water: EATONS NECK DUMP * 1975 (1)	Water: DREDGE SITE 1978 (3)	SEDIMENT ELUTRIATE 1975 (17)	SEDIMENT ELUTRIATE 1978 (9)
Nitrite Nitrogen (PPM)	0.010	0.017	0.011	0.013
Nitrate Nitrogen (PPM)	0.130	0.133	0.108	0.100
Sulfate (SO_4) (PPM)	1050	1600	916	1350
Oil & Grease (PPM)	0.50	5.00	1.44	11.60
Phosphorus - Ortho (PPM)	0.035	0.217	0.491	1.070
Phosphorus - Total (PPM)	0.043	0.220	0.533	1.130
HEAVY METALS				
Mercury ** (PPB)	0.00	0.002	0.494	0.002
Lead	0.007	0.005	0.0072	0.010
Zinc	0.014	0.009	0.008	0.015
Arsenic	0.006	0.003	0.022	0.015
Barium				
Berylium				
Cadmium	0.008	0.002	0.006	0.002
Chromium	0.012	0.005	0.012	0.005
Copper	0.017	0.007	0.013	0.009
Nickel	0.009	0.010	0.0092	0.022
Selenium				
Silver				
Vanadium	0.012	0.005	0.012	0.005
ORGANOHALOGENS				
Total PCB, (ppt)				
Total DDT, (ppt)				

** All heavy metal values are in parts per million except Mercury.

STAMFORD HARBOR Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
PE-1-71							2.27	70.1	23.7	33.2	
PE-2							2.29	46.2	14.7	31.5	
PE-3							2.27	70.0	21.6	30.3	
PE-4							2.55	79.4	30.3	36.5	
PE-5							2.59	83.5	51.9	51.1	
PE-6							2.57	83.5	36.7	43.0	
PE-7							2.31	79.9	35.0	43.8	
PE-8							2.30	75.5	31.0	40.4	
PE-9							2.57	77.4	37.0	45.8	
PE-10							2.56	83.7	34.7	41.4	
PE-11							2.56	81.2	32.7	39.6	
PE-12							2.53	79.9	30.8	39.0	
PE-13							2.40	81.8	29.2	53.4	
PE-14							2.38	71.2	22.7	31.6	
PE-15							2.33	69.3	21.0	30.1	
PE-16							2.63	72.4	39.7	54.5	
Mean-1971							2.44	75.3	33.1	40.3	
GE-1-76	C	N	58.6	96	38	58	2.57			49.86	
GE-2	M	N	91.7	111	45	66	2.54			32.42	

STAMFORD HARBOR Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
GE-3-76	M	B	93.5	115	56	59	2.53			35.94	
GE-4	M	N	95.7	130	54	76	2.57			34.04	
GE-5	M	N	92.6	144	53	91	2.53			27.68	
GE-6	M	N	93.3	138	53	85	2.56			34.62	
GE-7	M	N	88.2	132	53	79	2.55			36.04	
GE-8	G	N	17.1	122	49	73	2.58			34.07	
GE-9	M	N	87.5	138	54	84	2.46			26.74	
GE-10	G	N	41.6	134	63	71	2.55			34.63	
GE-11	M	N	87.8	114	56	58	2.52			25.75	
GE-12	M	N	86.2	156	58	98	2.48			25.46	
GE-13	M	N	89.7	149	54	95	2.37			23.77	
GE-14	C	N	66.3	221	49	172	2.24			20.92	
GE-15	S	N	23.9	84	40	44	2.55			54.92	
GE-16	S	N	23.6	101	41	60	2.59			52.22	
Mean-1975			71.1	130.3	51	79.3	2.51			34.32	
GEB-1-78	S	N	51	138	51	97	2.46			41.30	
GEB-2	M	N	86	120	46	74	2.55			32.71	
GEB-3	M	N	55	156	56	100	2.29			29.12	
Mean-May 1978			64	138	51	90.3	2.43			34.38	

STAMFORD HARBOR Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
PE-1-78	M	B	69.7	79	41	38	2.66	83.9	38.1	48.32	
PE-2	M	B	71.7	89	42	47	2.61	79.0	32.8	43.29	
PE-3	M	B	84.0	100	43	57	2.56	83.6	38.7	39.25	
PE-4	M	B	94.0	128	48	80	2.48	76.3	28.5	35.15	
PE-5	M	B	89.3	157	58	99	2.29	72.0	23.1	24.01	
PE-6 Surface	M	B	86.3	124	53	71	2.32	57.0	11.4	19.79	
PE-6 1'-2'	M	B	62.6	79	42	37	2.38	80.5	35.0	43.28	
PE-6 2'-3'	M	B	58.5	62	39	23	2.41	84.0	42.0	50.03	
PE-6 3'-4'	M	B	74.2	56	38	18	2.49	90.0	49.0	53.52	
PE-7	M	B	88.0	132	46	86	2.21	75.9	30.0	35.88	
PE-8	M	B	71.5	97	44	53	2.33	83.1	40.8	41.78	
PE-9	M	B	97.3	146	55	91	2.19	74.4	26.1	37.08	
PE-10	M	B	80.6	95	44	51	2.59	87.0	45.8	43.49	
PE-11	M	B	93.8	122	49	73	2.54	79.0	32.2	35.94	
PE-12	M	B	86.3	84	41	43	2.67	82.0	36.4	42.04	
PE-13	M	B	94.3	91	43	48	2.64	85.7	39.8	41.34	
PE-14	S	B	35.3	148	48	100	2.44	91.5	54.1	41.21	
PE-15	M	B	92.9	139	53	86	2.26	74.0	27.9	28.73	
GE-6	M	B	82.9	122	48	74	2.19			26.91	
Mean-Aug. 1978			79.6	107.9	46.1	61.8	2.43	79.9	35.1	38.48	

STAMFORD HARBOR Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
PE-1-79	M	N	84.1	98	43	55	2.60	81.9	36.0	44.39	127.65
PE-2	S	N	8.0				2.68	109.7	64.2		70.89
PE-2 lower	M	B	89.3	107	52	56	2.57			46.48	
PE-3	M	B	69.2	98	43	55	2.59	89.5	45.0	47.97	98.96
PE-4	M	B	55.6	76	36	40	2.65	93.3	54.3	57.62	72.01
PE-5	M	N	96.3	120	48	72	2.57	78.2	30.3	40.20	157.60
PE-6	M	B	70.7	91	40	51	2.60	104.1	52.5	45.45	98.23
PE-7	M	N	98.8	135	53	82	2.47	75.1	27.0	35.84	177.99
PE-8	M	N	85.9	97	43	54	2.58	84.2	36.3	42.69	131.75
PE-9	M	B	90.0	88	42	46	2.58	80.1	36.8	45.98	117.96
PE-10	M	B	73.3	64	39	25	2.45	81.7	38.8	47.81	110.70
PE-11	S	N	26.1	121	49	72	2.48	93.0	56.6	48.32	64.36
PE-12	M	N	97.7	152	60	92	2.31	74.1	24.9	33.16	197.37
PE-13	M	B	64.6	123	52	71	2.41	77.1	28.0	40.63	123.16
PE-14	M	B	85.4	147	54	93	2.26	70.3	22.5	31.18	212.00
PE-15	M	B	95.8	137	54	83	2.46	70.9	28.7	40.13	147.13
PE-16	M	B	64.1	71	44	27	2.41	71.1	35.1	49.24	102.82
PE-16 lower	M							85.8	40.1		113.98
PE-17	M	B	95.8	140	59	81	2.43	68.3	21.9	45.57	211.72
PE-18	M	B	97.8	157	58	99	2.45	65.1	21.2	32.46	206.65

STAMFORD HARBOR Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
PE-19-79	S	B	27.2	117	45	72	2.55	85.3	46.1	55.02	85.21
PE-20	S	B	45.4	117	52	66	2.41	78.4	37.2	47.33	110.61
PE-20 lower	S	B	14.9					114.9	91.6		25.52
PE-21	C	B	52.4	133	45	88	2.38	73.4	26.4	35.74	177.57
PE-22	C	B	93.8	142	58	84	2.31	71.5	23.6	33.74	202.51
PE-23	M	B	84.9	152	57	95	2.38	67.7	24.8	36.30	173.64
PE-24	M	B	91.9	154	61	92	2.28	68.1	21.5	31.84	216.87
PE-24 lower	M							78.5	26.4		197.62
PE-25	M	B	74.5	118	47	71	2.39	76.9	32.4	41.32	137.40
PE-26	M	B	84.8	132	51	81	2.43	72.4	24.6	33.55	194.36
PE-27	M	B	70.6	116	46	70	2.39	69.5	28.9	13.41	140.14
PE-28	G	B	18.5	135	46	89	2.57	84.5	49.5	58.63	70.64
PE-29	M	B	80.2	135	51	84	2.43	71.0	25.0	35.20	184.30
Mean-1979			70.6	119.8	49.2	70.6	2.47	80.2	36.2	41.28	139.35
Project Mean			72.9	119.7	48.8	71.1	2.46	78.9	35.2	38.86	139.35

STONY CREEK

ENVIRONMENTAL SAMPLING AND TESTING

STONY CREEK

Stony Creek, CT is a small recreational project on Central Long Island Sound. Environmental sampling and testing was undertaken in 1975. Sampling consisted of three tubes spaced evenly over the project. No samples tested showed any abnormal or above average values for any parameters tested.

STONY CREEK

Environmental Sampling History

June 1975 - Bulk Sediment Analysis (3)

PE-1-3

Lab Series: 100-207-1-3

Tests Run: Unit Weights, Limits, COD, Volatile Solids, TKN, 2 levels each metal - Hg, Pb, Zn, As, Cd, Cr, Cu, Ni, V, C-H-N's (3) DDT(1), PCB(1), grain size analysis.

STONY CREEK

Parameter	Organic Silts			Sands & Gravels		
	1975			1975		
% Volatile Solids - EPA	4.42			none		
% Volatile Solids - NED	3.23					
% Total Volatile Solids	6.89					
PPM Chem. Oxygen Demand	56,833					
PPM Total Kjeldahl Nitrogen	1,433					
PPM Oil and Grease	693					
# of tests on parameters above # of tests on parameters below	(3)/(6)					
PPM Mercury	0.243					
PPM Lead	49.7					
PPM Zinc	160.0					
PPM Arsenic	5.18					
PPM Cadmium	1.77					
PPM Chromium	61.0					
PPM Copper	85.3					
PPM Nickel	38.5					
PPM Vanadium	62.2					
% Total Carbon	2.03					
% Hydrogen	0.48					
% Nitrogen	0.19					
PPB DDT	0.007					
PPB PCB	0.100					

STONY CREEK Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
PE-1-75	M	N	98.8	77	36	41	2.66	90.7	43.9	53.21	
PE-2	M	N	96.9	69	36	33	2.66	94.4	46.5	52.71	
PE-3	M	N	86.3	49	32	17	2.67	90.5	49.0	49.92	
Mean-1975			94.0	65	34.7	30.3	2.66	91.9	46.5	51.94	

WATCH HILL COVE

ENVIRONMENTAL SAMPLING AND TESTING

WATCH HILL COVE

Watch Hill Cove, Rhode Island is a mainly recreational project located on Eastern Long Island Sound. Environmental sampling and testing was undertaken in 1971 and 1975. Sampling in 1971 consisted of three tube samples. Sampling in 1975 consisted of one grab sample taken in the entrance channel and one tube sample taken in the anchorage. One sample taken in 1971 showed above average values (values in excess of two standard deviations above the mean of all North Atlantic Tidal System samples) for volatile solids. All other samples taken in 1971 and all samples taken in 1975 showed no significantly high values for any parameters tested.

WATCH HILL COVE

Environmental Sampling History

September 1971-Bulk Sediment Analysis (3)	PE-1, 2, 3 Lab Series: 100-40-1-6 Tests Run: Unit Weights, Volatile Solids, COD, TKN, 3 each-Hg, Pb, Zn, grain size analysis.
August 1975-Bulk Sediment Analysis (2)	GE-5, PE-6 Lab Series: 100-209-6-7 Tests Run: Unit Weights, Volatile Solids, COD, TKN, 3 each-Hg, Pb, Zn, As, Cd, Cr, Cu, Ni, V, grain size analysis.

WATCH HILL COVE

Parameter	Organic Silts			Sands & Gravels		
	1971	1975		1971	1975	
% Volatile Solids - EPA	10.675	none		1.13	0.477	
% Volatile Solids - NED	8.77			1.0	0.50	
% Total Volatile Solids	13.54			4.39	1.327	
PPM Chem. Oxygen Demand	124,700			31,300	6820	
PPM Total Kjeldahl Nitrogen	3,050			1,100	95	
PPM Oil and Grease	1,835			320	165	
# of tests on parameters above / # of tests on parameters below	(2)/(4)			(1)/(2)	(2)/(3)	
PPM Mercury	0.245			0.095	.012	
PPM Lead	32.6			12.1	17.3	
PPM Zinc	67.2			19.8	10.07	
PPM Arsenic					0.63	
PPM Cadmium					0.67	
PPM Chromium					6.43	
PPM Copper					5.43	
PPM Nickel					7.37	
PPM Vanadium					16.3	
% Total Carbon						
% Hydrogen						
% Nitrogen						
PPB DDT						
PPB PCB						

WATCH HILL COVE Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
PE-1-71							2.633	123.8	99.1	80.27	
PE-2							2.393	79.9	28.2	35.14	
PE-3							2.434	81.7	28.7	34.88	
Mean-1971							2.487	95.1	52.0	50.10	
GE-5-75	S	B	5.3				2.64			80.74	
PE-6	S	B	1.9				2.69	135.4	111.4	80.74	
Mean-1975			3.6				2.67	135.4	111.4	80.74	
Project Mean			3.6				2.558	105.2	66.9	62.36	

WESTCOTT COVE

ENVIRONMENTAL SAMPLING AND TESTING

WESTCOTT COVE

Westcott Cove, CT is a mainly recreational project located on Western Long Island Sound. Environmental sampling and testing was undertaken in 1973, 1975 and 1977. Sampling in 1973 consisted of two grab samples in the outer end of the project channel, and two tube samples in the inner end. Sampling in 1975 consisted of three tube samples and one grab. Sampling in 1977 consisted of eight tubes and eight grabs. One grab sample taken in 1973 showed an abnormally high value (value in excess of two standard deviations above the mean of all North Atlantic Tidal System samples) for Cadmium. Samples taken in 1975 showed no unusually high values. One tube sample taken in 1977 showed an above average value (value in excess of one standard deviation above the mean) for Vanadium. All other samples showed no significantly high values for any parameters tested.

WESTCOTT COVE

Environmental Sampling History

April 1973 - Bulk Sediment Analysis (4)	PE-1,2, GE-3,4 Lab Series: 100-110-1-4 Tests Run: Unit Weights, Limits, Volatile Solids, COD, TKN, 5 each - Hg, Pb, Zn, As, Cd, Cr, Cu, Ni, V, DDT(1), PCB(1), grain size analysis.
July 1975 - Bulk Sediment Analysis (4)	PE-1,3,4, GE-2 Lab Series: 100-201-1-4 Tests Run: Unit Weights, Limits, Volatile Solids, COD, TKN, 7 each - Hg, Pb, Zn, As, Cd, Cr, Cu, Ni, V, C-H-N's (2), DDT(1), PCB(1), grain size analysis.
November 1977 - Bulk Sediment Analysis (16)	PE-5,9-15, GE-1-8,15,16, Lab Series: 100-271-1-21, Tests Run: Unit Weights, Limits, Volatile Solids, COD, TKN, 12 each - Hg, Pb, Zn, Cd, Cr, Cu, As, Ni, V, grain size analysis.

WESTCOTT COVE

Parameter	Organic Silts			Sands & Gravels		
	1973	1975	1977	1973	1975	1977
% Volatile Solids - EPA	7.12	5.69	6.91	0.787	1.908	2.02
% Volatile Solids - NED	5.84	4.36	5.17	0.664	2.04	
% Total Volatile Solids	11.22	7.94	9.45	2.327	3.40	
PPM Chem. Oxygen Demand	101,000	67,600	82,917	10,270	20,967	
PPM Total Kjeldahl Nitrogen	0	2330	3198	457	900	
PPM Oil and Grease	3280	2080	2211	237	850	
# of tests on parameters above / # of tests on parameters below	(1)/(2)	(1)/(2)	(5)/(11)	(3)/(3)	(3)/(5)	(1)
PPM Mercury	0.870	0.50	0.355	0.173	0.235	0.11
PPM Lead	78.5	77.0	101.3	28.3	32.6	28.1
PPM Zinc	186	217.5	195.2	45.0	69.8	56.3
PPM Arsenic	5.8	5.65	4.37	1.23	1.36	1.0
PPM Cadmium	3.8	2.95	3.40	12.37	0.88	1.1
PPM Chromium	111.5	136	85.2	17.67	71.40	28.1
PPM Copper	156.5	144.0	128.0	29.67	74.40	33.8
PPM Nickel	58.5	52.0	57.1	24.0	22.80	33.7
PPM Vanadium	72.5	38.0	82.6	24.0	12.1	28.1
% Total Carbon		2.31			3.22	
% Hydrogen		0.48			0.57	
% Nitrogen		0.21			0.31	
PPB DDT	110				100	
PPB PCB	70				200	

WESTCOTT COVE Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
PE-1-73	OH	N	60.3	77	39	38	2.630		41.9	39.67	
PE-2	S	N	10.9				2.653	133.5	101.0	71.08	
GE-3	S	N	0.1				2.716			79.76	
GE-4	S	N	27.9				2.700			68.52	
Mean-1973			24.8	77	39	38	2.675	133.5	71.4	64.76	
PE-1-75	S	N	18.3	68	35	33	2.63	120.0	83.4	61.03	
GE-2	S	N	7.1				2.58			70.65	
PE-3	M	N	83.4	76	42	34	2.61	93.5	44.4	48.57	
PE-4	S	N	4.7				2.66	138.0	115.3	81.36	
Mean-1975			28.4	72	38.5	33.5	2.62	117.2	81.0	65.40	
GE-1-77	S	B	0.2				2.69				
GE-2	S	N	0.0				2.68				
GE-3	S	B	0.1				2.75				
GE-4	S	N	0.1				2.68				
GE-5	S	B	0.4				2.64				
PE-5	S	B	1.2				2.67	138.5	118.7		
GE-6	S	B	0.3				2.65				
GE-7	S	B	0.2				2.64				

WESTCOTT COVE Sample	Dominant Soil Class.	Normal or Bimodal Curve (Nor B)	Percent Fines	Liquid Limit	Plastic Limit	Plastic Index	Specific Grav. (Solids)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Percent Solids	Moisture Content
GE-8-77	S	B	1.4				2.64				
PE-9	S	B	4.8				2.70	121.7	93.7		
PE-10	M	B	74,8	96	44	52	2.63	83.5	35.2	40.31	
PE-11	M	B	67.6	55	37	18	2.66	93.4	49.7	47.21	
PE-12	M	B	87.5	71	37	34	2.61	88.6	41.3	40.42	
PE-13	M	B	70.6	105	46	59	2.56	81.4	31.8	37.68	
PE-14	M	B	81.8	99	43	56	2.56	88.2	42.8	56.01	
PE-15	M	B	57.6				2.58	96.2	51.6	53.03	
GE-15	S	B	1.2				2.65				
GE-16	S	B	0.8				2.64				
Mean-1977			25.6	85.2	41.4	43.8	2.65	98.9	58.1	45.78	
Project Mean			25.9	80.9	40.4	40.5	2.649	106.4	65.4	56.81	

NOTE:

Test results for samples taken in late 1980 were not available at the time of printing and have not been included in the atlas, though some maps show their locations and partial data is included. Test results for these samples will be issued in the first supplement to be printed in 1981. The following is a list of those projects which have been sampled or are scheduled to be sampled during the remainder of the 1980 calender year.

VOLUME I

Black Rock Harbor - anchorages and Burr Creek
Bridgeport Harbor - main harbor, entrance channels, and Johnsons River anchorage
Mianus River
New Haven Harbor - Mill River and Quinnipiac River

VOLUME II

Fall River Harbor - Fall River below Brightman Street bridge, Mt. Hope Bay entrance channel, and Tiverton Basin

VOLUME III

Boston Harbor - President Roads anchorage
Chelsea River
Lynn Harbor - entrance channel - bioaccumulation
Mystic River
Salem Harbor - bioaccumulation
Weymouth-Fore River - improvement at Braintree, bioaccumulation and organohalogens

VOLUME IV

Kennebunk River - chemistry, elutriate (physical is included)